London Natural History Society

THE LONDON NATURALIST

Journal of the
LONDON NATURAL HISTORY SOCIETY

No. 92 2013

LONDON NATURAL HISTORY SOCIETY

The Society welcomes new members, both beginners and experts. Its recording area (the London Area) lies within a 20-mile (32-km) radius of St Paul's Cathedral and here most of its activities take place. Although much covered with bricks and mortar, it is an exciting region with an astonishing variety of flora and fauna. The Society is open to those interested in arachnology, archaeology, botany, conchology, conservation, ecology, entomology, geology, herpetology, mammalogy, ornithology, palaeontology, rambling, and all other aspects of natural history. The Society comprises various sections, but all meetings are open to members without formality.

Publications

The London Naturalist, published annually, contains papers on the natural history and archaeology of the London Area and beyond, including records of plants and animals.

The *London Bird Report*, also published annually, contains the bird records for the London Area for each year, as well as papers on various aspects of ornithology.

Bulletins of news items, including the Society's *Newsletter* are sent to members throughout the year.

Indoor meetings

These are held in most weeks throughout the year, with lectures, discussions, colour slides and films on all aspects of natural history.

Field meetings

Led by experts to visit interesting localities, both within and outside our Area. These excursions are very popular with beginners wishing to increase their knowledge, and enable members to get to know one another.

Library

A large selection of books and journals on most aspects of natural history is available for loan or consultation by members free of charge.

Reading circles

Many important natural history journals are circulated by the Sections at a fraction of the cost of subscribing direct.

SUBSCRIPTIONS

ORDINARY MEMBERS	£20.00
STUDENT MEMBERS	£5.00
SENIOR MEMBERS	£16.00
FAMILY MEMBERS	£4.00
CORPORATE SUBSCRIBERS	£20.00

Student membership is for persons under 18 or receiving full-time education, and senior membership is for persons over 65 who have been continuous members of the Society for ten complete years. All except family members receive one free copy of *The London Naturalist* and *London Bird Report* each year. Cheques and postal orders, payable to the London Natural History Society, should be addressed to

The Assistant Treasurer, LNHS,
Robin Blades,
32 Ashfield Road, London N14 7JY

THE LONDON NATURALIST

Further copies of this issue of *The London Naturalist* may be obtained (price £8 plus £2 postage and packing in the UK) from Catherine Schmitt, 4 Falkland Avenue, London N3 1QR. Back numbers of most recent issues of both *The London Naturalist* and *London Bird Report* are also available from the same address. Cheques should be made payable to the London Natural History Society.

Grizzled skipper as present at Featherbed Lane verge and Hutchinson's Bank Nature Reserve, both London Borough of Croydon. *Photo: Martin Wills*

Long-tailed blue at East India Dock Basin, 11 August 2012. *Photo: John Archer*

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LONDON NATURAL HISTORY SOCIETY

Founded 1858

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30 Arlington Gardens, London W4 4EY

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Editor, *London Bird Report:* P. Lambert, 109 Gloucester Road, London E17 6AF.

Editor, *Newsletter:* M. Burgess, 92 Fellows Road, London NW3 3JG.

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The Society's Recorders

Botany

Flowering plants and vascular cryptogams: Dr M. Spencer, 72 Michael Cliffe House, Skinner Street, London EC1R 0WX (020-7837 1471).

Fungi: Vacant.

Lichens: Vacant.

Bryophytes: P. Howarth, 38a Regina Road, London N4 3PP (07920 143431).

Ecology and Entomology

Mammals: C. Herbert, 67a Ridgeway Avenue, East Barnet, Hertfordshire EN4 8TL (armconservation@hotmail.com).

Reptiles and amphibians: T. E. S. Langton, B.SC., 12 Millfield Lane, London N6 6JD (t.langt@virgin.net).

Fishes: Vacant.

Arachnida: J. E. D. Milner, B.SC., 80 Weston Park, London N8 9TB (acacia@dial.pipex.com).

Coleoptera (Carabidae and Coccinellidae): P. R. Mabbott, B.SC., 49 Endowood Road, Sheffield S7 2LY (paulmabbott@blueyonder.co.uk).

Coleoptera (Lucanidae and Buprestidae): Dr D. S. Hackett, FRES, 3 Bryanstone Road, London N8 8TN (danielhackett@blueyonder.co.uk).

Coleoptera (families not otherwise listed): M. V. L. Barclay, 47 Tynemouth Street, London SW6 2QS (m.barclay@nhm.ac.uk).

Soil-dwelling invertebrates (Myriapoda, Isopoda, Diplura): Andy Keay, 37 Merrymeet, Woodmansterne, Surrey SM7 3HX (andykeay1@aol.com).

Lepidoptera (butterflies): L. R. Williams, 34 Christchurch Avenue, Kenton, Harrow, Middlesex HA3 8NJ (leslie.williams1597@btinternet.com).

Lepidoptera (moths), Syrphidae, and invertebrates not otherwise listed: C. W. Plant, B.SC., FRES, 14 West Road, Bishop's Stortford, Hertfordshire CM23 3QP (cpauk1@ntlworld.com).

Orthoptera: Sarah Barnes, 33 Tavern Close, Carshalton, Surrey SM5 1JE (lnhs.orthoptera@virginmedia.com).

Hymenoptera Aculeata: R. W. J. Uffen, 4 Mardley Avenue, Welwyn, Hertfordshire AL6 0UD (01438 714968, ruffen@talktalk.net).

Hemiptera: T. Bantock, 101 Crouch Hill, London N8 9RD (tristanba@ googlemail.com).

Odonata: Neil Anderson, B.SC., 52 Beechwood Avenue, Greenford, Middlesex UB6 9UB (neil@anders42.freeserve.co.uk).

Plant galls: T. Root, 1 Whitecastle Mansions, Wakemans Hill Avenue, London NW9 0UX (trroot@hotmail.co.uk).

Mollusca: Vacant.

Records may be sent to the appropriate recorder (where shown) or to Colin Plant who will distribute to each recorder the relevant data from a mixed set of records.

Geology

Vacant

Ornithology

Buckinghamshire: A. V. Moon, 46 Highfield Way, Rickmansworth, Hertfordshire WD3 7PR (andrew.moon@talk21.com).

Essex: R. Woodward, 62c High Street, Cheshunt, Hertfordshire EN8 0AH (roy.rkwoodward@ ntlworld.com).

Hertfordshire: Joan Thompson, 73 Raglan Gardens, Watford, Hertfordshire WD19 4LJ (lnhshertsrecorder@jksthompson.plus.com).

Inner London: R. Bonser, Flat 7, 96 Rope Street, London SE16 7TQ (richbonser8181@ hotmail.com).

Kent: J. Archer, 8 Smead Way, London SE13 7GE (john_archer@gofast.co.uk).

Middlesex: S. Huggins, 206 East Ferry Road, London E14 3AY (seanhuggins@hotmail.co.uk).

Surrey: N. Tanner, 11 Collins House, Newby Place, London E14 0AX (nick_tanner@talk21.com).

Records should be sent to the appropriate recorder.

Contents

Report of the Society for the year ending 30 June 2012

Approved at the Annual General Meeting on 13 December 2012

Objectives

The objectives of the Society are the study and recording of natural history, archaeology and other kindred subjects, especially within twenty miles of St Paul's Cathedral, the promotion of scientific investigations, the appreciation and conservation of the natural environment and the publication in the Society's journals of scientific and educational papers. Activities and achievements in respect of these objectives are described below.

Governance: Council, Committees and Sections

The Society is governed by a Council of Trustees, comprising the officers (president, treasurer, secretary), up to ten representatives of the members at large and one representative of each of the Society's Sections (currently five). Catherine Schmitt represented the Ecology and Entomology Section, David Darrell-Lambert represented the London Bird Club and John Swindells replaced Ted Tuddenham as the Botany Section representative on Ted's election as President. Stuart Cole remained as representative for the Bookham Common Survey

Rule 4(c), limiting a continuous period of elected membership to five years, came into force in December 2005 and was first implemented at the AGM in 2010. This rule means that David Allen, Robin Blades and David Dawson will stand down at the end of the current year.

The Administration and Finance Committee, chaired by Michael Wilsdon, dealt with much delegated business.

Membership

Sixty-seven new members joined during the year, compared with 80 last year. The number of individual members currently stands at 948, compared with 960 at the same time last year, and 984 the previous year.

The Society is not just for experts — field meetings are planned with beginners in mind, and newcomers are encouraged to play an active part in the Society's affairs.

We record with regret the deaths of the following members during the year to 30 June (date of joining in brackets): Mr John Baker (1994), Ms Margaret Ferguson (1988), Mr Eric Groves (1950), Mr Peter Holland (1957), Mr Bryan Radcliffe (1968), Mr Peter Tate (1948).

Finances

The year to 30 June 2012 saw the rewards of the changes to the LNHS investment strategy. Until recently our reserves were being held in a cash account and earning interest, which in recent years has been very limited. Council took the view that this ultra-cautious approach to investments was inappropriate given the long-term nature of our organization. Council therefore moved a significant proportion of investments into, still highly cautious, charity bond accounts (based on the underlying assets of corporate and Governmental bonds). Further detail on the Society's

finances in the year is contained in the Treasurer's Report and Financial Statements.

Activities

Fieldwork continues for a new flora of the London area to replace Rodney Burton's *Flora of the London Area*. The area for the report will be the LNHS recording area but recording efforts are concentrated on the Greater London Authority area which has not had the same level of recent surveying as the outlying parts of our area. The majority of Botany Section field meetings have been 'flora focused'. Members are encouraged to get out and 'bash a square' or two for this project.

The Ecology and Entomology Section continued to run its well-attended programme of field and indoor meetings covering a diverse group of taxa and developing a group of regular attendees as well as more occasional joiners. The section again represented the LNHS at the annual exhibitions of the Amateur Entomologists' Society and the British Entomological and Natural History Society.

Under the brand of the London Bird Club the Society has continued to run a series of field meetings showing the diversity of bird life that the LNHS area has to offer. Indoor meetings have continued to prove popular and covered a wider variety of birding topics.

The LNHS provided funding towards the production of the colour plates of alien herpetofauna that were included in *The London Naturalist* **90**.

Recording and recorders

The Ecology and Entomology Section appointed Tommy Roots as recorder of plant galls in 2011.

Thanks go to our outgoing recorders for all their work and a warm welcome is extended to those coming in.

Journals

The London Naturalist **90** (2011) was published in December 2011. *London Bird Report* for 2008 was published in November 2011 and publication of the 2009 and 2010 reports are anticipated in the next report year (indeed the 2009 report had already gone out by the time this annual report was written).

Library

As noted in the previous report David Allen has been appointed as LNHS librarian and he continues the good work of Linda Hewitt, our previous librarian, with our library now settled into its new home in the Angela Marmont Centre for UK Biodiversity at the NHM's Darwin Centre Phase 2, making it available to the public (for reference) and LNHS members (for borrowing). The library is an important resource for members, providing access to a wide range of out-of-print and hard-to-find natural history titles, and, unlike many other libraries, the Angela Marmont Centre is very welcoming of people bringing in specimens to try to identify. Members are encouraged to make use of it.

Conservation of the natural environment

Rich habitats are still under threat from developers, though these threats are currently less likely in the depressed economic climate. The most high profile

of these at the moment is the High Speed 2 rail link which will run through the north-western part of our recording area. The Society is often asked to lend its voice to protests against such developments. Council's view is that an appropriate campaigning body in such cases is the London Wildlife Trust, the LNHS being better placed to provide evidence-based advice if required. Our partnership with GiGL helps ensure that our high-quality validated records are available for such purposes.

This report has been prepared with due regard to the Charity Commission's guidance on public benefit.

Treasurer's report for 2011/2012

As last year, the Society's accounts are presented on a receipts and payments basis, as permitted by the Charity Commission.

At the end of the financial year on 30 June 2012, the total net assets of the Society as detailed in the Statement of Assets and Liabilities had risen to £355,615 compared with £315,711 the previous year.

The Receipts and Payments Accounts for the year show that payments exceeded receipts by £185 (2011: receipts exceeded payments by £4,160).

Receipts from members and supporters amounted to £43,503 compared with £21,839 the previous year with the increase mainly as a result of additional legacies received, totalling £22,747. Total receipts in the year amounted to £59,243 (2011: £172,310, which had included transfers from the COIF Deposit Fund amounting to £139,500). Income from the Society's investments increased from £10,217 in the previous year to £14,878.

Total expenditure was £59,428, compared with £168,150 in the previous year, the difference being largely due to the purchase of the M&G Charibond investment amounting to £135,000 in the previous year. Otherwise the most significant movements in the year were the purchase of further units in the COIF Charities Fixed Interest Fund at a cost of £25,000 and a 59 per cent increase in publication costs, to £12,713 (2011: £7,964) reflecting increased costs of a larger, full-colour volume of *The London Naturalist*, partially offset by more economical production of the *London Bird Report*.

Reserves policy

The Society's unrestricted general funds can be regarded as expendable endowment since they are invested to provide a regular source of income as well as capital growth, over time.

Statement of trustees' responsibilities

Law applicable to charities in England and Wales requires the trustees to prepare financial statements for each financial year which give a true and fair view of the charity's financial activities during the year and of its financial position at the end of the year. In preparing those financial statements the trustees are required:

- to select suitable accounting policies and then apply them consistently
- to make judgements and estimates that are reasonable and prudent
- to state whether applicable accounting standards and statements of recommended practice have been followed subject to any departures disclosed and explained in the financial statements
- to prepare the financial statements on the going concern basis unless it is inappropriate to presume that the charity will continue to operate.

The trustees are responsible for keeping accounting records which disclose with reasonable accuracy at any time the financial position of the charity and enable them to ensure that the financial statements comply with the Charities Act 2011. They are also responsible for safeguarding the assets of the charity and hence for taking reasonable steps for the prevention and detection of fraud or other irregularities.

Independent examiner's report to the trustees of the London Natural History Society

I report on the financial statements of the charity for the year ended 30 June 2012 as set out below.

This report is made solely to the charity's trustees, as a body, in accordance with section 145 Charities Act 2011. My work has been undertaken so that I might state to the charity's trustees those matters I am required to state to them in this report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the charity and the charity's members as a body, for this report, or for the opinions we have formed.

Respective responsibilities of trustees and examiner

The charity's trustees are responsible for the preparation of financial statements. The charity's trustees consider that an audit is not required for the year under section 144(1) of the Charities Act 2011 ('The 2011 Act') and that an independent examination is needed.

It is my responsibility:

- to examine the financial statements under section 145 of the 2011 Act
- to follow the procedures laid down in the General Directions given by the Charity Commissioners under section 145(5) of the 2011 Act
- to state where particular matters have come to my attention.

Basis of independent examiner's report

My examination was carried out in accordance with the General Directions given by the Charity Commissioners. An examination includes a review of the accounting records kept by the charity and a comparison of the financial statements presented with those records. It also includes consideration of any unusual items or disclosures in the financial statements and seeks explanations from you as trustees concerning any such matters. The procedures undertaken do not provide all the evidence that would be required in an audit, and consequently no opinion is given as to whether the financial statements present a 'true and fair view' and the report is limited to those matters set out in the statement below.

Independent examiner's statement

In connection with my examination, no matter has come to my attention:

(a) which gives me reasonable cause to believe that in any material respect the requirements:

- to keep accounting records in accordance with Section 130 of the 2011 Act
- to prepare financial statements which accord with the accounting records and to comply with the accounting requirements of the 2011 Act have not been met; or

(b) to which, in my opinion, attention should be drawn in order to enable proper understanding of the financial statements to be reached.

J. L. Meyer, FCA
Meyer Williams (Chartered Accountants)
Queen Alexandra House,
2 Bluecoats Avenue,
Hertford, Herts SG14 1PB
5 November 2012

Statement of assets and liabilities as at 30 June 2012

	2012		2011	
	£	£	£	£
Monetary assets				
Bank balances:				
National Westminster current account		—		4,850
National Westminster reserve account		**8,873**		4,139
Cash in hand		**647**		716
		9,520		9,705
Investment assets				
M&G Charibond		**138,105**		131,253
COIF Fixed Interest Fund		**162,085**		128,848
COIF Charities Deposit Fund		**47,465**		47,465
		347,655		307,566
Non-monetary assets				
Sundry debtors		—		—
Current liabilities				
Sundry creditors and accruals		(1,560)		(1,560)
Net assets		**£355,615**		£315,711

Approved on behalf of the trustees on 2 November 2012
E. G. D. Tuddenham – President
M. J. West – Treasurer

Receipts and payments account for the year ended 30 June 2012

Receipts		2012		2011
	£	£	£	£
Receipts from members and supporters:				
Subscriptions		**16,276**		16,370
Donations and other income		**719**		567
Legacies		**22,747**		1,000
Tax recovered on subscriptions and donations under Gift Aid		**3,761**		3,902
		43,503		21,839
Sales:				
Journals		**527**		618
The Breeding Birds of the London Area		**57**		66
Other publications		**53**		44
Merchandise		**225**		26
		862		754
Charities Fixed Interest Fund	**7,539**		3,685	
Charities Deposit Fund interest	**382**		1,006	
Income from M&G Charibond	**6,937**		5,503	
Bank Deposit Account interest	**8**		6	
Interest on Gift Aid tax recovered	**12**		17	
		14,878		10,217
Asset and investment sales:				
Receipts from COIF Charities Deposit Fund		—		139,500
Total receipts		**59,243**		172,310
Less: total payments (below)		**(59,428)**		(168,150)
Net (payments) / receipts for the year		**(185)**		4,160
Cash at bank and in hand as at 1 July 2011		**9,705**		5,545
Cash at bank and in hand as at 30 June 2012		**9,520**		9,705

Payments follow overleaf

Payments

	2012		2011	
	£	£	£	£
Meetings costs, sectional and general expenditure:				
Hire of halls and rooms	**1,195**		1,031	
Lecturers' fees and expenses, sectional expenses etc.	**731**		799	
Postage and telephone	**308**		193	
Stationery	**87**		108	
Services	**239**		591	
Independent examiner's fees	**1,560**		2,115	
Insurance	**1,789**		1,853	
Honorarium and expense allowances	**126**		626	
Bank charges (net of refunds)	**58**		—	
		6,093		7,316
Grants payable:				
Grant to RSPB for Sparrow project	—		200	
		—		200
Publications:				
Printing and expenses:				
The London Naturalist No. 89	—		4,497	
The London Naturalist No. 90	**9,621**		—	
London Bird Report 2007	—		3,467	
London Bird Report 2008	**3,092**		—	
		12,713		7,964
Programme	**615**		594	
Bulletin and *Newsletters*	**4,081**		4,689	
Mailing	**7,923**		6,759	
		12,619		12,042
Publications / journal sales expenditure		**348**		276
Library		**1,839**		5,179
Publicity		**421**		—
Merchandise		—		173
Asset and investment purchases:				
Purchase of laptop		**395**		—
Purchase of COIF charities fixed interest fund units		**25,000**		—
Purchase of M&G Charibond investment		—		135,000
Total payments for the year		**£59,428**		£168,150

Official and sectional reports for 2012

CONSERVATION

The London Biodiversity Partnership (LBP) had another challenging year. A major setback was the complete loss of funding from Natural England for the Partnership's Co-ordinator post. Taken together with a further lack of support from the GLA, the Partnership appears to be facing a bleak future. It is clear that there is now a vacuum in biodiversity leadership in London and a new type of biodiversity partnership will be needed to fill the gap. This dire state of affairs is partly a reflection of the dramatic changes in national nature conservation policy following the publication in 2012 of the government's new National Planning Policy Framework. The previous Planning Policy Statements on nature conservation have been withdrawn and there is now a presumption in favour of 'sustainable development'. It is uncertain how this will affect wildlife in the capital but it seems unlikely that it will help. The majority of conservation work in London is carried out through the boroughs, either directly or through local voluntary groups. In a recent survey by the London Wildlife Trust, half the boroughs responding reported a reduction in biodiversity funding between 2007 and 2012. Such funding has always been meagre — now it is drying up still further. Financial constraints and loss of staff were the most common challenges encountered. In such testing times, the work of the voluntary sector has become critically important. In particular, the Trust for Conservation Volunteers (TCV) is playing an invaluable role in co-ordinating the work of local Friends Groups. In my own Borough of Haringey, the TCV are based at Railway Fields, which now acts as a 'hub' for their activities throughout north London. Without their input many of London's best-loved green places would be in trouble.

Second only to habitat loss and degradation, invasive non-native species are considered by Defra to pose the greatest threat to biodiversity worldwide. In Great Britain as a whole however, where much of our flora is introduced and there are few endemic species, this threat is less severe. But in London, where the city's pre-eminence as a centre for international travel and trade has made it particularly vulnerable to invasion by non-native organisms, this has become a considerable problem. In addition, the capital's 'heat island effect', whereby the central, built-up parts of London experience higher temperatures than the periphery, has allowed a range of warmth-loving non-native plants and animals to become established. The great majority of these are harmless, but a few have become invasive (the tree-of-heaven *Ailanthus altissima* is a notorious example), and others may become so. As a result, in 2011 the London Invasive Species Initiative (LISI) was established as a subgroup of the LBP. Following much hard work from Joanna Heisse of the Environment Agency, Defra provided funding to pay for a Project Manager for four years and Karen Harper was duly appointed in early 2012. She immediately set to work putting together a draft *London Invasive Species Plan* (LISP). By the end of the year, a detailed consultation draft was circulated to interested organizations (available at: londonisi.org.uk/lisp/) and I responded on behalf of the LNHS. The *Plan* is based on *The Invasive Non-Native Species Framework Strategy for Great Britain* published by Defra in 2008. The LISP contains a list of 'Species of Concern' divided into various priority categories. Many of these are 'familiar faces' and derive from earlier legislation; for example in the plant kingdom, floating

pennywort *Hydrocotyle ranunculoides* and duck-potato *Sagittaria latifolia* are listed as Schedule 9 species in the Wildlife and Countryside Act, 1981. Many others are shown simply as 'Additional species relevant to London' and include such potentially troublesome plants as butterfly-bush *Buddleja davidii* and cherry laurel *Prunus laurocerasus*, as well as the above-mentioned tree-of-heaven. The final version of the LISP is due to be signed off in September 2013 and should be consulted for further information.

I am grateful to Dave Webb (Environment Agency) for details concerning LBP and to Karen Harper (Project Manager, LISI) for information about the LISP.

DAVID BEVAN, *Conservation Officer*

BOTANY

At our AGM on 13 November, Ken Adams shared with us his deep knowledge of the ecology of Epping Forest. He gave a vivid description of the ecological changes in the Forest over the past fifty years. He prefaced his talk by reminding us of recent research by Plantlife, suggesting that one in five of our native plant species is under threat and that, on average, each county is losing one species every year. Essex is no exception, and Epping Forest has fared particularly badly. Most of the decline can be ascribed to changes in management, though atmospheric pollution, climate change and human disturbance have also played a part.

The Forest has a varied geology — a mix of London Clay, merging upwards into the Claygate Beds and the Bagshot Sands; at the top (in places) is a thin layer of pre-Anglian Thames Gravels (the Stanmore Gravels), giving rise to areas of wet heath such as the Sunshine and Deer Shelter Plains. In the valleys are a number of bogs, supporting important wetland plant communities.

The character of many of the Forest's habitats is changing. The beech population has greatly diminished as pollarded trees grew huge and often died; they were replaced by areas of bramble and dense stands of birch. Droughts since the 1960s have caused the death of many beeches on slopes because they are not used to drought. Those on hill-tops have fared better. The knothole moss *Zygodon forsteri* (otherwise only known from the New Forest and Burnham Beeches), is still found in the root hollows of around seventy beech trees at Court Hill. Open areas are scrubbing up very quickly. In the past, the trees were kept pollarded and deer kept the foliage down, which allowed the oaks to do well. Now Turkey oak, which survives drought and comes up under a closed canopy, is out-competing native English oak, which does not. This is now the most invasive species along with Norway maple.

The main areas of woodland have always had a rather low plant diversity, but the ride edges used to be much richer, with devil's-bit scabious, betony, lousewort, slender St John's-wort, goldenrod, ragged-robin, common yellow sedge and several species of hawkweed. These are all acid-loving plants, which, together with a range of specialist liverworts, were widespread along the poached edges of the rides back in the 1960s. They have now all gone, partly as a result of the use of hoggin (which has a high pH) on the rides themselves, which has slowly destroyed the edge habitat through the percolation of alkaline material. This has been exacerbated by the practice of flailing the ride margins in June and July. Increasing numbers of muntjac, which, unlike the declining

fallow deer, will eat virtually anything, have made matters worse. Finally, the heavy use of even the most minor paths by motor-bikers has added to the problem. Sadly, today the rides are dominated by nettles, thistles and docks.

The Forest's grasslands have also suffered, with a loss of around a third of the area present in the 1960s. Ken showed us a number of aerial photographs to prove the point. The quality of the surviving grasslands has also declined as increasing fertility through atmospheric nitrogen pollution and dog activities have taken their toll. Betony, devil's-bit scabious, heath milkwort, spiny restharrow and harebells, for example, have all now either disappeared or become very scarce, as the grasslands have scrubbed over.

There is better news on bryophytes. About a dozen species have recently returned as sulphur dioxide levels in the atmosphere came down. The acid-loving *Rhytidiadelphus loreus*, for example, previously extinct in Essex, has now been refound.

By contrast with other habitats, wet heathland is doing well, with a successful programme of targeted cattle grazing overseen by Jeremy Dagley, the Forest's Conservation Manager. This has effectively held back scrub invasion and allowed many heathland species to survive. Heather itself is doing well and cross-leaved heath is still present. Sadly, bell heather was last seen in the late 1970s, but two sundew species still hang on, various sedges thrive and cottongrass is found in two places. Around two hundred plants of heath-spotted orchid can still be found and creeping willow seems to have benefited from the grazing.

Ken continued his comprehensive tour of the Forest by describing the dry heathland and the various ponds. He ended by listing some of the many additional special plants that are still to be seen: barberry, petty whin (a single bush), marsh cinquefoil, bistort, water avens (introduced fifty years ago), and several (introduced) colonies of marsh fern.

Ken's talk was a real tour de force and was very well received.

Indoor meetings

The year began with two of our hardy favourites – Best Botanical Photographs and the increasingly popular Botany Quiz Night, organized by George Hounsome and John Swindells (reviewed in LNHS *Newsletter* No. 229, May 2013). In February, bryophyte recorder Peter Howarth ran a bryophyte workshop to follow up on his field trip to Epping Forest. In the spring, Professor Ian Trueman gave us a detailed account of the work that went into the *Flora of Birmingham and the Black Country*, a subject of much interest for our work on the London Flora Project. As part of training for the latter project, John Swindells ran a workshop on umbellifers in July. Finally, in October, John Poland gave a popular and well-attended workshop on his (and Eric Clement's) book: *The Vegetative Key to the British Flora* (BSBI, 2009).

Field meetings

A full programme of field meetings was, once again, admirably organized by George Hounsome. By early November, we had undertaken a record thirty-four programmed meetings since the last AGM, twenty-one of which were London Flora Project recording meetings. Attendance was good, averaging around ten to twelve participants of all abilities. The weather varied from torrential rain to blistering heat (as usual).

Recording meetings for the Flora of London covered a wide variety of sites including: Westminster, Darlands Lake, Lewisham, Sydenham, Beckenham, Tolworth Court, South Wimbledon, Chatley Heath, Rammey Marsh, Deptford Power Station and Deptford Wharf, a chalk pit in Thurrock, Stanmore Common, Obelisk Pond and Cow Pond at Virginia Water, Shakespeare Road sidings and Surrey Docks. In the autumn, there were more recording visits to Herne Hill, Clapham Junction, Wimbledon Common and Banstead Downs.

Peter Howarth led two bryophyte meetings early in the year to Epping Forest and Thursley, and a third in the autumn to Crane Island. There were also two visits in the spring and summer to our regular stamping ground of the London Zoo, led as usual by Sven Seiffert. In the summer, John Swindells led his always-interesting evening walk — Pot Luck in the East End; Tom Cope introduced us to Kew's wild plants; and there was a visit with Tim Pyner to Paglesham for saltmarsh flora. Ted Tuddenham led a fungus foray in the spring, in addition to the twenty-second consecutive Grand Haringey Fungus Foray in late October.

Recorders' reports

Higher plants (Mark Spencer)

The London Flora Project has been 'ticking along' this year with the ten-km co-ordinators settling into their roles and gathering teams of people around them. Later this winter, I will be arranging a series of meetings with them to review progress and ensure that accumulated records are distributed to the relevant vice-county recorders. Various field meetings have been held, with Nick Bertrand in particular holding a very successful series of events in his area.

The very large and complicated process of collating historic records is continuing; key highlights are:

- The map data from Rodney Burton's *Flora of the London Area* has now been sent to the BSBI and GiGL; Clive Schofield is undertaking further work to extract the text records
- Clive has extracted the data from Duggie Kent's *The Historical Flora of Middlesex* and its *Supplement*; this too will be submitted to the BSBI and GiGL, once final editing is completed
- I am receiving assistance from GiGL to compile various archival spreadsheets to enable these data to be submitted to the BSBI and GiGL.

Further tasks to be completed include:

- Extracting the data from Kent and Lousley's *A Handlist of the Plants of the London Area*
- Deciphering and extracting the data from the remaining LNHS index cards compiled by Lousley, Kent and Burton (currently housed at the NHM).

Although there are overlaps within the information content of all of these historic data sources I am convinced that it is best to format these data into one system and then remove duplicates and edit records.

Fungi

There was a remarkable extension of the 2011 autumn/early winter season of fungi right into the new year with 'winter fungi' continuing to emerge as late as the solstice of 2012. Thus blewits and mushrooms were still on the menu in February when a severe frost finally put paid to the late-winter fungal sightings.

Our official spring foray was held as late as 20 May at Lesnes Abbey Wood, where the finds were pretty sparse. The summer was dull for mycologists compared to 2011. It was also one of the wettest summers on record with severe flooding in many parts of the country and crop failures. This did not however seem to induce any fungi to appear. Early autumn was dry by contrast and no fungi appeared until the rains came again in early October. Despite our expectations, the autumn season only began more than three weeks after the rains, when the temperature dropped.

The grand Haringey foray was held as usual on the last Sunday in October and produced a fine list of nearly a hundred species. Of these twelve were eaten at the fry-up afterwards. Notable finds included the reappearance of *Hericium coralloides* in its usual station at Tottenham cemetery. In Alexandra Park a Red Data List rarity appeared — the bear cockleshell *Lentinellus ursinus* — on a rotten birch log. This was a new record for London, for the vice-county and for the substrate. Waxcaps have started to appear so it looks as though we will have another prolonged autumn season of foraying. ID sessions are proving very popular. We are holding them in rotation at four sites advertised via Londonfungi and the LNHS website.

Bryophytes

The main area of focus in this recording year has been the collation of the existing records of bryophytes. The study of bryophytes in London goes back a long way and as a result, over eighty liverworts and 300 mosses have been recorded from the London Area. Some of these records are historic and the species are no longer present. However some, like the Red Data Book species *Pallavicinia lyellii*, can still be found. The next phase of the work will be to check all the older and more unusual records to gain an up-to-date picture of the bryophytes of London.

In order to encourage recording, three walks and one indoor session were held. All were successful and well attended, in spite of very bad weather on the outing to Thursley. These meetings are continuing, with a trip to Wimbledon Common planned in February 2013.

DAVID BEVAN, *Chairman,* SARAH GRAHAM-BROWN, *Secretary*

ECOLOGY AND ENTOMOLOGY

The section again ran a full and varied selection of field meetings and indoor talks and workshops, as well as taking an extensive part in the Society's long-running survey of Bookham Common, despite some having to be curtailed or cancelled due to the year's less than clement weather. Thanks are particularly due to Tristan Bantock, Claudia Watts and Stuart Cole for their organizational roles in these activities. Meetings are listed in the Society's biannual *Programme* and many are summarized for our quarterly *Newsletter*.

Many thanks also to all members of the Section's committee and its long list of recorders for the time and skills which they offer freely to the Section and the Society as a whole. We are indebted to the leaders of and speakers at our meetings for sharing their skills and knowledge, and know that many members have taken enjoyment and a sense of fulfilment from them.

Special note should be made of the retirement from the Section's committee of Catherine Schmitt after many years of distinguished service. The committee

expressed its appreciation and indebtedness to Catherine with an appropriate presentation at her final committee meeting.

No volunteer coming forward to run the Section's Reading Circle at this year's sectional AGM, the Reading Circle has been discontinued from the end of the year. We are grateful to David Howdon for having run the Reading Circle most ably for many years.

MICK MASSIE, *Chairman*, KEIR MOTTRAM, *Secretary*

LONDON BIRD CLUB

The London Bird Club has maintained steady growth. Field trips to identify birds at hotspots around London were arranged nearly every weekend and there were many interesting birds seen on our coach trips. Everyone involved in the *London Bird Report* again made a magnificent effort and in 2012, we published *LBR* 2009. This was printed in colour throughout and completely redesigned. Timed tetrad counts for the London bird atlas have been undertaken in all tetrads during the winter season and about 99 per cent of tetrads for the breeding season.

Officers' reports for 2012

Pete Lambert reports on the field meetings: 'In 2012 we organized thirty-four walks. Eight of these were to the following sites which we had not visited recently: Bedfont Lakes, Farnham Heath, Wimbledon Common, East Tilbury, Bushy Park, Alexandra Park, Isle of Sheppey (by car) and Richmond Park. The other sites we visited were Cheshunt GPs, Tooting Common, East India Dock, Southend, Trent Park, South Ealing Cemetery, Hyde Park/Kensington Gardens, Fairlop Waters, Wandsworth Common, Crossness, Totteridge, Sewardstone, Wormwood Scrubs, Forty Hall, Amwell NR, Beddington Farmlands, Rye Meads, Theobalds Park, Horsenden Heath and Two Tree Island.

'Scarcer birds seen included the following: Cheshunt and Bedfont Lakes had smew; Southend and East India Dock had Mediterranean gulls; East Tilbury had avocets; Alexandra Park had a kittiwake; Horsenden Hill had little and tawny owl; Beddington Farmlands had tree sparrows.

'I'd like to thank all the leaders of these walks for giving up their time to do this.

'I am always on the lookout for new places for walks, and new leaders to take people round. Please let me know if you have any suggestions for either.'

Neil Anderson reports on the coach trips: '2012 began with a very successful trip to Titchwell RSPB Reserve where alders near the visitor centre had a flock containing three species of redpoll, quite a few lesser redpolls and a couple of common (and elusive at times) Coue's arctic redpoll. Not far away was an obliging water rail. A Chinese water deer was a surprise here. Seawatching also produced a good selection of birds.

'Rutland Water was visited in February during a cold spell and severe weather forecast for the end of the day. With frozen conditions wildfowl was concentrated. The real highlight was seeing both marsh and willow tits using a feeder and gave an educational experience; the latter having disappeared from southern England. Red deer and brown hares were mammal highlights of the trip.

'Our first spring trip was to Rye Harbour where some heard a nightingale. Quite a few Mediterranean gulls and Sandwich terns were breeding on the pits. A highlight was observing marsh harriers displaying.

'In July we had our first ever late summer trip to Dungeness. Sea watching produced many gannets, arctic and great skua as well as several harbour porpoises. A great white egret was standing next to a little egret, which was fortunate for size comparison. This is a bird we are seeing more frequently. There were migrants such as yellow wagtail, wheatear and whinchat but a real highlight was a dragonfly migrant — we had excellent views of a lesser emperor near the visitor centre.

'The final field meeting was our second trip to Hickling Broad and I'm pleased to say with better weather than the first. We were treated to both Bewick's swans and pinkfeet flying over. At the raptor watch point we saw merlin, many marsh and a single hen harrier, barn and short-eared owls plus several cranes. A fine end to the birding year.

'It was a good year in terms of wildlife seen and buoyant numbers of members joining these coach trips.'

Kat Duke reports on the indoor meetings: 'The key news for indoor meetings this year was the change of venue. After much searching we found a new home in The LookOut, or Isis Education Centre, in Hyde Park, run by The Royal Parks Foundation. We had outgrown Camley Street and Imperial (the latter also proving a little unpopular with members), and the new venue is a lovely, brand new, highly-equipped and very flexible space that talks' attendees have shown much enthusiasm for. The only downside is that it is located a few minutes' walk into the park and paths are unlit and, as yet, lack signposting to guide people to the venue. However, record high attendances for talks at the new venue indicate that its benefits outweigh the drawback of its park location.

'Attendance at 2012 indoor meetings saw a significant overall increase from 2011, particularly after we started using our new venue in September 2012. In January Brian Nobbs' Flights of Fancy talk on feathers attracted twenty-eight people and February's talk from Tim Mackrill on The Rutland Water Osprey Reintroduction Project was highly praised but attracted only fourteen people, while March's talk on Red Kites in The Chilterns from Ann and Phil Farrer saw twenty-six people attend. The last talk at Camley Street was in April and was from Dave Dawson who addressed What's Happened To London's House Sparrows? This drew in thirty-two attendees, including some non-LNHS members. The new season of talks in the new venue kicked off with a joint LBC and Ecology and Entomology talk in September from Roy Woodward. This was on Dragonflies – The Birdwatcher's Insect, and it attracted a record high thirty-six attendees. The October talk from Graham Appleton of the BTO called What's Next For Cuckoos And Migration Research? saw thirty-six people in attendance too, so numbers are looking healthier and healthier. Traditionally, the final talk of the year comes from our Chairman, David Darrell-Lambert, straight after the London Bird Club AGM, and this year's ID talk, Unwrapping Raptors didn't disappoint, attracting twenty-eight people including two non-members. This smaller number may be due to the fact that this was the only autumn talk still at an old venue, i.e. Imperial College. It will be interesting to see if next year's AGM, which is to be held at the Hyde Park venue, will enjoy a better attendance.

'The increase in attendance numbers may be due partially to renewed efforts to publicize the talks more widely and to this end talks are being added to The Lecture List website, which is an online listing of public talks taking place in the UK, and also on the BirdGuides website events page. Coupled with our talks being publicized on The Royal Parks Foundation website, these efforts are collectively broadening our audience and spreading the LNHS's reach.'

Andrew Self, chairman of the Recorders' Committee, reports: 'Thanks to the continued effort put in by our bird recorders, we were able to produce another high quality *London Bird Report* in 2012. Attempting to catch up on the production of the report meant there was no let-up in the timetable and the database for 2010 was also completed, enabling work on the *LBR* to be started. Working to a slightly different schedule, data were also sent to the Rare Breeding Birds Panel for 2011.'

Bob Watts, chairman of the Rarities Committee reports: 'The Rarities Committee welcomed the addition of Dave Bradnum, the sixth member, and his assistance with Essex records, which form a significant percentage of description species, is to be much welcomed.'

Ian Woodward reports on the London Atlas: 'Although fieldwork for the national BTO Atlas finished in 2011, fieldwork for the London Atlas project continued for an additional year in 2012. Timed counts have now been undertaken in all tetrads during the winter season, and in around 99 per cent of tetrads during the breeding season. Work on writing up the results of the project is under progress.'

Angela Linnell reports: 'The number of members of the Ornithology Reading Circle remained the same. New members are always welcome. These journals are circulated for a small subscription: *Ardea, British Birds, Dutch Birding, Ibis, Irish Birds* and *Scottish Birds*. Please contact me if you would like to join the Reading Circle.'

As always, the Committee look forward to hearing from any members, especially beginners, who want to make suggestions to improve the work of the London Bird Club. We hope you will take the opportunity to promote the Club, particularly to younger birdwatchers. We have a lot to offer — including the fact that the LNHS covers plants, insects and all aspects of natural history. We also hope you will suggest topics for our indoor meetings and come along on the weekly field trips, where you will find some of London's hidden gems with the chance of seeing some wonderful birds.

David Darrell-Lambert, *Chairman* (david@birdbrainuk.com),
Angela Linnell, *Committee Secretary* (angela.linnell@phonecoop.coop)

The Tottenham plant list of Thomas Johnson, 1638

JOHN EDGINGTON
19 Mecklenburgh Square, London WC1N 2AD

Abstract

The Royal Botanic Gardens at Kew possesses a manuscript list, or *Catalogus*, of nearly 300 plants growing at Tottenham, attributed to Thomas Johnson and dated 1638. This list, containing many first records for Middlesex, was studied by D. H. Kent (1975) who mentioned about sixty per cent of the plants in *The historical flora of Middlesex*; the rest remain unpublished. The *Catalogus* is bound with other works by Johnson in a single composite volume; the provenance of this volume, and the circumstances under which Johnson prepared the *Catalogus*, are discussed. The plant list is printed here in full for the first time, with some comments about its significance in relation to Johnson's other lists of London plants, and what it tells us about Tottenham's rural economy and habitats in Johnson's time.

Introduction

Readers of D. H. Kent's *The historical flora of Middlesex* (1975) will notice that many first records for the vice-county are attributed to 'T. Johnson, 1638'. This refers to '*Catalogus plantarum juxta Tottenham lectarum*', a list of plants growing around Tottenham compiled by Thomas Johnson in 1638. Kent (1975: 13) noted 'it was unfortunately never published but a copy of the manuscript (the whereabouts of the original is not known) is preserved in the Library of the Royal Botanic Gardens, Kew'. Seeking information about one of these first records (of *Equisetum fluviatile*) I decided to consult the manuscript in Kew's pre-Linnaean collection. I found what I wanted, but much more besides. What follows is an account of the unusual circumstances surrounding the production of this manuscript and material at Kew associated with it, beginning with some remarks about Johnson himself, and including a complete list of the plants he found at Tottenham, published here for the first time.

Johnson's botanical publications

Thomas Johnson (1600–1644) was a London apothecary and the ablest botanist of his day. Accounts of his botanizing excursions into Kent with fellow 'simplers' were published in two books commonly referred to by the first words of their lengthy titles: *Iter* (1629) and *Descriptio* (1632). Each has an appendix listing plants seen on and around Hampstead Heath. That in *Iter* relates to a visit in August 1629 while the appendix to *Descriptio* records plants seen at various subsequent times; these are Britain's earliest local floras. Both books

are extremely rare, only four copies of *Iter* and five of *Descriptio* being known (Gilmour 1972, 1977). In 1633 Johnson published the work for which he is best known, his enlarged and substantially rewritten edition of John Gerard's *Herball, or generall historie of plantes,* the so-called 'emaculate' edition. In 1634 Johnson travelled through the west country to Wales, accompanied by a group of friends known as the 'Socii Itinerantes'. His *Mercurius botanicus*, published the same year, described their journey and included a comprehensive list of the plants of southern England, including the *Iter* and *Descriptio* records. In 1639 Johnson, with one companion, made a long visit to north Wales, publishing the plants they found there, with a few others not previously listed, in *Mercurii botanici, pars altera* (1641). He died at the siege of Basing House in 1644 while fighting for the Royalist cause.

Johnson's works at Kew

Besides several copies of Gerard's 'emaculate' *Herball*, Kew holds two other volumes of Johnson's works. One is *Mercurius botanicus* in a contemporary binding. The other is a composite volume, re-bound in 1964, containing: (i) a facsimile manuscript transcript of *Descriptio*; (ii) *Mercurius botanicus* and *Mercurii botanici, pars altera*; (iii) the manuscript of *Catalogus plantarum juxta Tottenham lectarum*. The front end-paper of the volume bears a manuscript inscription (Figure 1), in what appears to be an eighteenth-century hand: 'The Plants near Tottenham are copied from a Ms Catalogue of Johnson's in D[r] Richardson's possession (of Bierley near Bradford, one of Ray's friends) who gave me this Mercurius Botanicus which was Ray's own copy'. Richard Richardson (1663–1741) was an enthusiastic gentleman botanist who collected widely in north Britain and Wales and was responsible for many new records that he communicated to Ray, Sherard and Dillenius. He was an avid bibliophile who commissioned Sherard and Sir Hans Sloane to procure for him both newly published and rare editions of botanical books. The author of this note, and indeed the provenance of the whole volume, is unknown — the only information held at Kew is the accession record of its receipt from the bindery in 1964.

Both parts of *Mercurius botanicus* are printed on very thin paper. The leaves have been expertly trimmed and reset in modern paper mounts so as to retain all the printed matter and the numerous manuscript annotations. Whether they really belonged to John Ray is unclear, and the subject of further study. The annotations include a short list of plants found, probably between 1670 and

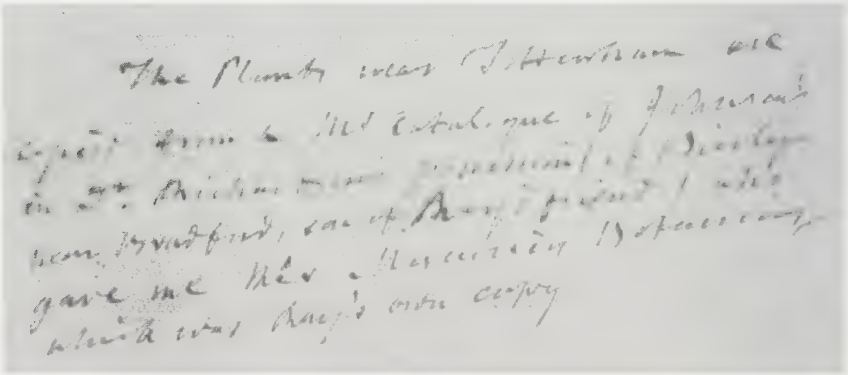

FIGURE 1. Inscription on front end-paper of Kew's composite volume.

1690, near Kingston upon Thames. Many of these are the earliest vice-county records for Surrey; they have not been noticed previously and a publication is in preparation.

The facsimile of *Descriptio* is a remarkable achievement. It was almost certainly produced by Thomas Wilson who, starting as a bookseller in Leeds, became one of the most skilled and accurate transcribers of rare books and manuscripts in the days before mechanical copiers made their trade redundant. In 1740 Wilson wrote to Richardson offering his services as a copyist of 'your uncle Hopkinson's manuscripts, and some other choice books in your library'. We do not have Richardson's reply (he died the following year) but we do have Wilson's letter of 1747 to his son, also Richard. Wilson had evidently transcribed several items for Richardson, including the family's copy of the Domesday Book for the county of York, and was pleased with his own work, adding that he believed there were 'not half a dozen copies of it in the world. I won't copy it again, for the best friend I have, under ten guineas a copy, to preserve its rarity.' (These letters were printed by Dawson Turner (1835)). Wilson appears to have been the man to whom connoisseurs turned for copies of their precious volumes. Comparison between the printed original of *Descriptio* and the Kew facsimile (Figures 2 and 3) shows the fidelity of the copy.

The ownership of the original *Descriptio*, and its eventual fate, are unknown. Richardson's library eventually passed to his great-granddaughter Miss Richardson Currer of Eshton Hall, Yorkshire. The contents were catalogued in


Descriptio
Itineris Plantarum
Investigationis ergô susceptî, in Agrum Cantianum
Anno Dom. 1632.
Et
Enumeratio Plantarum in Ericeto Hamptedianæ locisq; vicinis crescentium.
Sibi ne invideatur ipsi ignavi rectè cavent.
Plaut. in Bacch.
Excudebat, Tho. Cotes. 1632.

FIGURE 2. Sample printed pages of Johnson's *Descriptio*: (left) title page; (right) illustration of the seaweeds *Laminaria saccharina* and *L. digitata*.

1833 and sold at auction in 1862; *Descriptio* appears in neither catalogue. Whether it is one of the five copies now known (British Library; Magdalen College, Oxford (2 copies); Department of Botany, Oxford; University Library, Cambridge) is an unresolved question. The British Library copy was in Sloane's library which, on his death, formed the nucleus of the British Museum's collection. Gilmour (1972) noted that in this copy the illustrations are bound at the beginning rather than in their natural place at the end as they are in the other copies, and the Kew facsimile. As the book used by the copyist would need to be disbound to enable the illustrations to be copied so accurately, it is interesting to speculàte that Sloane loaned his *Descriptio* to his good friend Richardson for copying and the leaves were subsequently re-bound out of sequence.

Catalogus plantarum juxta Tottenham lectarum

This manuscript consists of twenty-seven pages written on both sides of fourteen leaves. Figure 4 shows the first and eighth pages. The handwriting is identical with that of the *Descriptio* facsimile (compare Figure 3) and there can be no doubt that the same copyist, presumed to be Thomas Wilson, was responsible for both. Moreover, the structure of the *Catalogus* facsimile suggests that Wilson was working from printed pages, not a manuscript as the unknown author of Figure 1 implies. At the bottom of each page is a catchword, anticipating the initial syllable or word on the following page; this is a device to assist collation of printed pages and was rarely used in continuous manuscript (and then usually at the end of a complete quire or gathering). There are unusual word-breaks at the end of some lines that would be unnecessary in a handwritten document but are typical of printed works of the time. Underlining is used, as now, to indicate italic text which was used for proper nouns such as the authorities for plant names, while bold text is indicated by Roman capitals. Figure 4 shows examples of these features that can also be seen in the *Descriptio* facsimile. I conclude that the manuscript *Catalogus* is very likely a copy of a printed text that apparently has not survived. Had it been published it would have taken its place alongside *Iter*, *Descriptio* and *Mercurius botanicus* as a significant early work.

Its contents are given in full, with the original pagination, in the Appendix: 297 species are recorded, of which two appear twice under different names (so 299 entries); 293 vascular plants, one charophyte and three lichens. The *Catalogus* is a simple list of names, apart from two short comments on page 17. Identification is generally easy; the recent translation of John Ray's Cambridge Catalogue of 1660 (Oswald and Preston 2011), which uses many of the same pre-Linnaean synonyms, has been of considerable assistance. Remaining doubts are discussed in the footnotes to the Appendix. I have added modern botanical names in square brackets and listed them alphabetically, with a cross-reference to their *Catalogus* page, in Table 1.

As noted earlier, the *Catalogus* was first drawn to botanists' attention by Douglas Kent (1975). Kent named 174 of the vascular plants, either as first records for Middlesex, or, if there is an earlier record, in the lists of selected later records. However he omitted 119 names (40 per cent of the total), for one of two reasons. In the first case the plant had been recorded previously and is so widespread that he gave no subsequent records, or only a limited selection from his District 7, the Inner London region of the vice-county. (Kent adopted the divisions used by Trimen and Dyer (1865). He called division 7 the Metropolitan District, separated from District 6 to the north by a line from Tottenham High Cross to Tottenham Hale. This line unfortunately cuts right

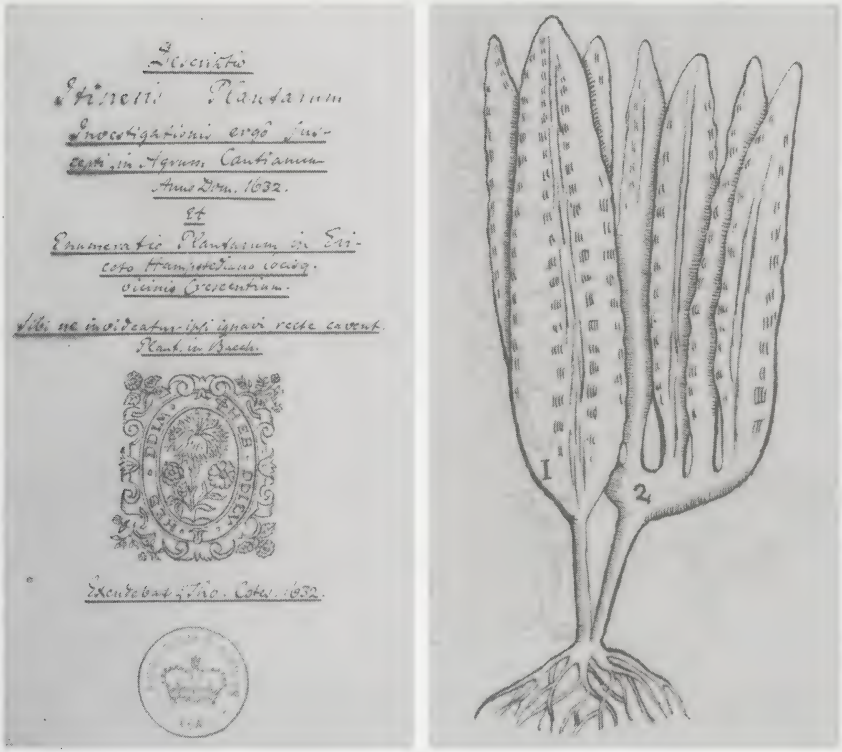

FIGURE 3. Sample pages of the manuscript facsimile of Johnson's *Descriptio* at Kew: (left) and (right) as in Figure 2.

across the centre of Johnson's botanizing area. Kent assigned Johnson's records to District 6 or 7 in what seems an arbitrary way.) There are fifty-three such taxa; they include common plants like *Elytrigia repens* couch-grass and *Mercurialis annua* annual mercury, but also some less-familiar London species such as *Lathyrus nissolia* crimson grass vetchling and *Sherardia arvensis* field madder. The second reason may have been Kent's natural caution; for a further sixty-six taxa he gave a later date as the earliest record, often qualifying this by calling it the first 'certain evidence'. These tend to be the more difficult taxa where Kent may not have trusted Johnson's discrimination, or taxa whose circumscription has changed since Johnson's time or that have been subdivided further. *Rumex crispus* curled dock, *Chenopodium album* fat hen and *Lemna minor* common duckweed probably fall in the first category, *Aphanes arvensis* parsley piert, *Nasturtium officinale* watercress and *Polygonum aviculare* knotgrass in the second. In some cases — *Berberis vulgaris* barberry, *Epilobium parviflorum* small-flowered willowherb and *Teesdalia nudicaulis* shepherd's cress are examples — the identification seems secure and it is not clear why Kent excluded these records.

The anonymous inscription at the front of Kew's composite volume names Johnson as the author of the *Catalogus*. Convincing evidence that it was in fact his work is the exact agreement between the names used here and those in *Mercurius botanicus*, whose text (with occasional omissions) the *Catalogus*

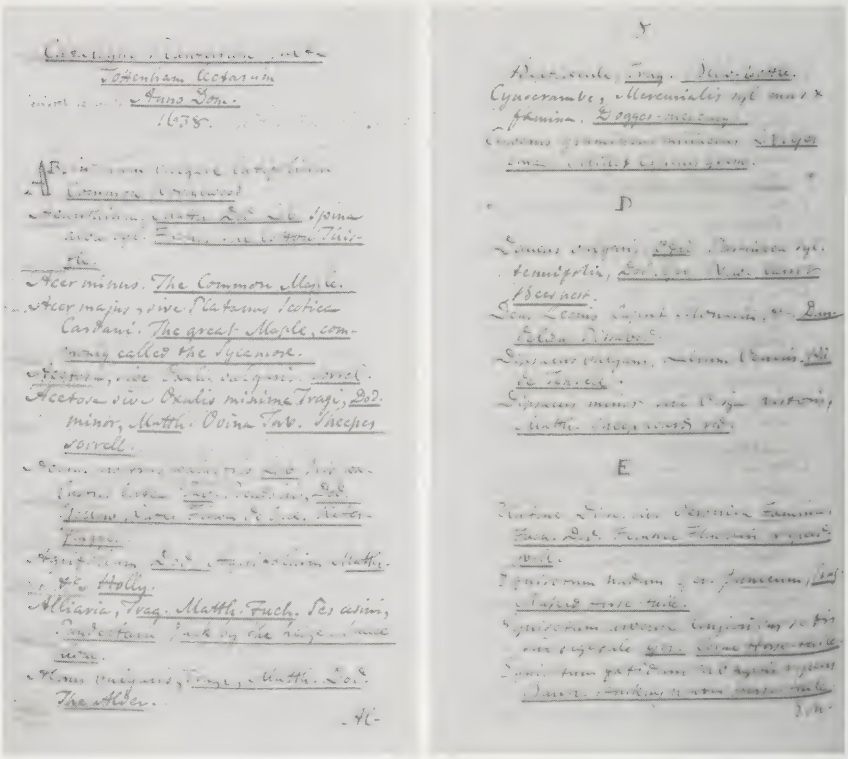

FIGURE 4. Sample pages from the manuscript facsimile of Johnson's *Catalogus plantarum juxta Tottenham lectarum* at Kew: (left) first page; (right) page 8 (on which appears the entry for *Equisetum fluviatile*, my original reason for investigating the *Catalogus*).

follows faithfully. An example is the fourth plant on the list, *Acer pseudoplatanus* sycamore. Girolamo Cardano (1501–1576) is an unusual authority for the name 'Platanus'; but whereas Ray (1660, citing Cardano for the only time) renders his synonym as simply 'Platanus', Johnson, in all his works, uses the fuller version, 'Platanus Scotica'. The congruence between the names here and in Johnson's other writings confirms him as the author.

Tottenham in Johnson's time

The manor of Tottenham ('Toteham' in the Domesday Book) stretched along the high road to Scotland, the Roman Ermine Street, from Stoke Newington to Edmonton, and from the River Lea in the east to Wood Green in the west. At the beginning of the seventeenth century the manor was held by the Earl of Dorset who in 1619 caused his estates to be surveyed and mapped. The resulting map of Tottenham, a portion of which is shown in Figure 5, is highly detailed. Note that south is towards the top. The map shows a rural scene with the River Moselle, draining the heights of Muswell Hill, meandering through on its way to the Lea at the Hale (Tottenham Hale).

Many of the map's features can be recognized today, if only by name. Philip Lane still runs east from West Green to meet the High Road at High Cross (now Tottenham) Green, close to High Cross itself. Berry Lane has become

FIGURE 5. Part of the Earl of Dorset's map of Tottenham in 1619.

Lordship Lane. Marke Fields has transferred its name to the recreation ground closer to the River Lea. Page Green, first mentioned in 1348, survives as a nondescript strip of amenity land between Broad Lane and Ashmount Road. The cluster of trees where Page Green meets the High Road were a famous circle of seven elms known as the Seven Sisters, whose name lives on centuries after the trees themselves. In the centre of the circle grew an ancient walnut tree. According to William Bedwell, writing in 1631: 'This Tree hath these

many yeares stod there, and it is observed yearly to live and beare leavs, and yet to stand at a stay; that is to growe neither greater nor higher: the people do commonly tell the reason to bee, for that there was one burnt upon that place for the profession of the gospell: but who it was, and when it should be done, they cannot tell; and I finde no such thing in our stories upon record, and therefore I do not tell this for a truthe' (quoted in Robinson 1818). This walnut was doubtless the actual tree Johnson recorded in *Catalogus*.

In her recent book *Tottenham: a history* Christine Protz (2009) points out that Tottenham is a very early example of enclosure, with boundaries around its fields, gardens, houses and woods, and that this resulted from successive lords of the manor leasing out the demesne land rather than farming it themselves. By 1619 there was very little common land for grazing or wood pasture. This was unfortunate for the landless villagers but made the district attractive to better-off outsiders whose enclosed houses and gardens began to occupy both sides of the High Road, until then a sparsely populated lane. By Johnson's time Tottenham had become a favoured retreat for well-to-do Londoners, a reputation that endured for a full century. Protz (2009) quotes Daniel Defoe's comment on the fine buildings of Tottenham, that 'they are generally belonging to the middle sort of mankind grown wealthy by trade, and who still taste of London; some of them live both in the city and the country at the same time, yet many of these are extremely wealthy'. The Lordship House, for example (the Earl of Dorset's own residence, now Bruce Castle, site of Haringey Borough Council's Museum Services), is shown as rented out to one Sir Thomas Penistone.

The plants in the *Catalogus*, therefore, are those of a mosaic of arable fields, pastures and water meadows, orchards, farmyards and woods, all recognizable on the map. Arable weeds include *Agrostemma githago* corncockle, *Centaurea cyanus* cornflower, *Kickxia spuria* round-leaved fluellen and *Scandix pecten-veneris* shepherd's needle, as well as seriously pernicious species such as *Lolium temulentum* darnel. Damp grassland supported *Chamaemelum nobile* chamomile, *Centaurea calcitrapa* red star-thistle and *Mentha pulegium* pennyroyal, while *Hyoscyamus niger* henbane and *Chenopodium vulvaria* stinking goosefoot decorated the dung heaps. The abundance of aquatic plants, including *Hydrocharis morsus-ranae* frogbit, *Nymphaea alba* and *Nuphar lutea* white and yellow water-lilies, *Potamogeton* waterweeds and *Ranunculus* Sect. *Batrachium* water crowfoots reminds us how much has been lost through drainage. Other notable plants include *Dipsacus pilosus* small teasel and *Verbascum blattaria* moth mullein. *Linum usitatissimum* flax and *Isatis tinctoria* woad were presumably casuals which may have been grown locally for their fibre and dye respectively. *Hyacinthoides non-scripta* bluebell and *Lonicera periclymenum* honeysuckle are among the few strictly woodland plants on the list; remnants of ancient woodland were being lost to agriculture even in Johnson's time. He did not include standing crops (though perhaps *Hordeum distichon* two-rowed barley is an exception) but did record casual escapes like *Phalaris canariensis* canary-grass (which he had seen in Kent in 1632) as well as *Buxus sempervirens* box, *Berberis vulgaris* barberry and *Sempervivum tectorum* houseleek that, like the *Juglans regia* walnut, were probably planted. There are no garden escapes on the list.

The significance of the *Catalogus*

The presence of both early- and later-flowering species — *Erophila verna* common whitlowgrass and *Knautia arvensis* field scabious are examples of each — shows that Johnson visited Tottenham, at least intermittently, over a full

season. Kent's suggestion that he may have had a country house here is entirely plausible, in light of the information in Protz (2009). His list may therefore be regarded as comprehensive. It includes far more species than he and his companions recorded on and around Hampstead Heath (72 in 1629, 97, including many repeated records, in 1632) although the areas of the two districts are broadly similar — about 15 km^2 for Tottenham and perhaps 10 km^2 for the Hampstead surveys. About forty-two Tottenham species were not mentioned at all in *Iter* or *Descriptio*; these include some of our commonest grasses such as *Alopecurus pratensis* meadow foxtail, *Holcus lanatus* Yorkshire fog and *Phleum pratense* Timothy which Johnson must surely have seen earlier in Kent or Hampstead, but surprisingly did not record there.

The list includes *Shoenoplectus tabernaemontani* grey club-rush for which Johnson's is the first British record, preceding Ray's of 1696 (see Appendix, Note 5).

The *Catalogus* is thus a valuable record of the native flora of an intensively cultivated part of south-east England before drainage, agricultural improvement and urbanization took their toll. It is a fitting, and significant, addition to Johnson's publications of 1629, 1632, 1633, 1634 and 1641. Douglas Kent consulted it and clearly knew it intimately, and it is in tribute to him that I publish it here in full.

Acknowledgements

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TABLE 1. Tottenham plants, 1638.

The number gives the page of Johnson's *Catalogus* (Appendix) on which the entry occurs.

Asterisks denote records omitted by Kent, as follows:
* Common plants first recorded before 1638.
** Plants for which Kent gave a date after 1638 for the first record or certain evidence.

Acer campestre 1
***Acer pseudoplatanus* (Note 1) 1
Achillea millefolium 17
Achillea ptarmica 21
Agrostemma githago 21
Ajuga reptans 4
Alisma plantago-aquatica 20
Alliaria petiolata 1
Alnus glutinosa 1
***Alopecurus pratensis* 11
Anagallis arvensis ssp. *arvensis* 2
**Anchusa arvensis* 4
Anisantha sterilis 9
Anthemis cotula 7
Anthriscus sylvestris 6
***Apera spica-venti* 11
***Aphanes arvensis* s.l. 19
Arabidopsis thaliana 20
***Arctium lappa* or *A. minus* 3
***Arenaria serpyllifolia* s.l. 2
Artemisia absinthium 1
Artemisia vulgaris 3
**Arum maculatum* 3
**Asplenium scolopendrium* 20
**Atriplex patula* 3
**Barbarea vulgaris* 3
Bellis perennis 3
***Berberis vulgaris* 18
**Bidens tripartita* 9
**Brassica nigra* 24
***Brassica rapa* 18
**Briza media* 20
Bryonia dioica 4
Buxus sempervirens 4
Calamagrostis epigejos 11
Caltha palustris 5
**Calystegia sepium* 7
Capsella bursa-pastoris 4
**Cardamine pratensis* 5
***Carduus crispus* 5
Carduus tenuiflorus 5
***Carex muricata* agg. 11
***Carex nigra* agg. 11
**Carex otrubae* 11
Carex pseudocyperus 12
**Carpinus betulus* 4
Castanea sativa 6
Centaurea calcitrapa 5
Centaurea cyanus 7
Centaurea nigra s.l. 13
***Centaurea scabiosa* 13
Centaurium erythraea 6
Cerastium glomeratum 15
Chaenorhinum minus 2
Chamaemelum nobile 6
Chelidonium majus 6
***Chenopodium album* 3
Chenopodium bonus-henricus 4
***Chenopodium murale* 3
Chenopodium vulvaria 3
Cichorium intybus 6
Cirsium arvense 5
Cirsium palustre 5
Conium maculatum 6
**Conopodium majus* 4
Convolvulus arvensis 7
Cornus sanguinea 7
Corylus avellana 7
***Crataegus monogyna* agg. 18
Crepis capillaris 12
Cruciata laevipes 7
**Cynosurus cristatus* 11
Cytisus scoparius 10
Dactylorhiza fuchsii 18
Daucus carota 8
Descurainia sophia 25
Dipsacus fullonum 8
Dipsacus pilosus 8
***Dryopteris filix-mas* 9
**Elytrigia repens* 11
Epilobium hirsutum 15
***Epilobium parviflorum* 16
Equisetum arvense 8
Equisetum fluviatile 8
**Erodium cicutarium* 10
**Erophila verna* s.l. 19
Erysimum cheiri 14
Euonymus europaeus 9
Eupatorium cannabinum 9
Euphorbia exigua 9
Euphorbia helioscopia 26
***Euphrasia* spp. 9
Fagus sylvatica 9
**Ficaria verna* 6
***Filago vulgaris* 10
Filipendula ulmaria 27
**Fraxinus excelsior* 9
***Fumaria* spp. 10
***Galeopsis angustifolia* 14
Galeopsis tetrahit s.l. 5
Galium aparine 2
Galium palustre 10
Galium verum 10
**Geranium molle* 10
**Geranium robertianum* 10
Geum urbanum 5
Glebionis segetum 6
Glechoma hederacea 12
***Glyceria fluitans* 11
***Glyceria maxima* 11

Hedera helix 12
Heracleum sphondylium 25
Holcus lanatus 10
***Hordeum distichon* 13
Hordeum murinum (Note 2) 12
***Hordeum secalinum* 11
Humulus lupulus 15
**Hyacinthoides non-scripta* 13
Hydrocharis morsus-ranae 17
Hydrocotyle vulgaris 7
Hyoscyamus niger 13
Hypericum perforatum 13
Hypochaeris radicata 12
Ilex aquifolium 1
Iris pseudacorus 1
Isatis tinctoria 10
***Juglans regia* (Note 3) 13
**Juncus bufonius* 11
***Juncus conglomeratus* 13
Juncus inflexus 13
**Kickxia spuria* 8
Knautia arvensis 24
***Lactuca serriola* forma *serriola* 14
Lamium album 14
Lamium purpureum 14
Lapsana communis 14
**Lathyrus nissolia* 6
Lathryus pratensis 14
***Lemna minor* 14
Leontodon hispidus 12
Lepidium campestre 25
**Lepidium coronopus* 7
Leucanthemum vulgare 3
Ligustrum vulgare 15
Linaria vulgaris 15
Linum usitatissimum 15
Lithospermum arvense 2
Lithospermum officinale 15
Lolium perenne 15
***Lolium temulentum* (Note 2) 15
Lonicera periclymenum 20
**Lysimachia nummularia* 18
Lythrum salicaria 16
***Malus sylvestris* 16
Malva neglecta 16
Malva sylvestris 16
Melilotus altissimus 16
***Mentha aquatica* 16
***Mentha arvensis* 4
**Mentha pulegium* 22
***Mentha* × *villosa* 16
**Mercurialis annua* 16
**Mercurialis perennis* 8
***Myosotis arvensis* 17
***Myosotis scorpioides* 17
***Nasturtium officinale* s.l. 24
Nuphar lutea 18
Nymphaea alba 18
**Oenanthe fistulosa* 18
Onopordum acanthium 1
Papaver argemone 2
***Papaver dubium* 19
Papaver rhoeas 19
Persicaria amphibia 21
***Persicaria hydropiper* 20
Persicaria maculosa 19
Phalaris canariensis 20
***Phleum bertolonii* 11
***Phleum pratense* 11
Phragmites australis 3
***Pisum sativum* (Note 2) 20
**Plantago coronopus* 7
**Plantago lanceolata* 20
Plantago major 20
***Poa pratensis* s.l. 10
***Polygonum aviculare* s.l. 21
Polypodium vulgare s.l. 21
Populus nigra 21
**Populus tremula* 21
***Potamogeton natans* 21
Potamogeton perfoliatus 21
Potentilla anserina 2
**Potentilla reptans* 19
Potentilla sterilis 9
Primula veris 21
Primula vulgaris 21
Prunella vulgaris 21
***Prunus avium* 6
***Prunus domestica* ssp. *insititia* 21
**Prunus spinosa* 21
**Pulicaria dysenterica* 7
Quercus robur 22
**Ranunculus acris* 22
***Ranunculus aquatilis* 22
Ranunculus arvensis 22
Ranunculus auricomus 22
**Ranunculus bulbosus* 22
**Ranunculus flammula* 22
***Ranunculus lingua* 22
Ranunculus repens 22
***Ranunculus trichophyllus* 17
Rhinanthus minor 19
***Rosa canina* 23
Rosa pimpinellifolia 23
**Rubus fruticosus* agg. 23
Rumex acetosa 1
***Rumex acetosella* 1
***Rumex crispus* 14
Rumex hydrolapathum 14
**Sagittaria sagittifolia* 23
***Salix caprea* 23
***Salix viminalis* 23
***Salix* spp. 23
**Sambucus nigra* 24
Sanguisorba officinalis (Note 4) 20
Saponaria officinalis 24
**Saxifraga tridactylites* 19
Scandix pecten-veneris 19
***Schoenoplecctus tabernaemontani* 13
Scirpus sylvaticus 8
Scorzoneroides autumnalis 12
***Scrophularia nodosa* 24
**Scutellaria galericulata* 16
Sedum acre 24
***Sedum album* 24
Sempervivum tectorum (Note 5) 24
Senecio jacobaea 13
Senecio vulgaris 24

**Sherardia arvensis* 23
Silene dioica 15
Silene flos-cuculi 2
Silene latifolia 15
Silybum marianum 5
Sinapis arvensis 23
Sisymbrium officinale 13
Solanum dulcamara 24
Solanum nigrum 24
Sonchus asper 25
***Sonchus oleraceus* 25
Sorbus aria 25
**Sorbus aucuparia* 25
Sparganium erectum 25
Spergula arvensis 25
Stachys sylvatica 10
**Stellaria graminea* 12
Stellaria holostea 12
Stellaria media 2
Symphytum officinale 7
Tamus communis 4
Tanacetum parthenium 19
Tanacetum vulgare 25
Taraxacum spp. 8
***Teesdalia nudicaulis* 4
Teucrium scorodonia 24
**Thlaspi arvense* 24
Torilis japonica 6
**Tragopogon pratensis* 26
Trifolium campestre 26
Trifolium fragiferum 26
Trifolium pratense 26
Trifolium repens 26
Tussilago farfara 26
Typha latifolia 26
**Ulex europaeus* 10
Ulmus procera 27
Urtica dioica 27
Valeriana officinalis 26
***Valerianella locusta* 14
***Verbascum blattaria* 4
Verbena officinalis 27
Veronica arvensis 2
Veronica beccabunga 2
Veronica hederifolia 2
**Veronica serpyllifolia* 27
Viburnum lantana 27
***Vicia faba* (Note 2) 9
Vicia hirsuta 2
**Vicia sativa* ssp. *nigra* 2
***Vicia sativa* ssp. *sativa* 27
Viola odorata 27
Viola tricolor 27
***Viola* spp. 27
***Vulpia myuros* 11

***Chara* spp. 8
Cladonia spp. (Note 6) 17
Usnea spp. (Note 6) 17
A foliose lichen (Note 6) 15

Notes:

1. Kent stated that he himself first recorded the tree regenerating, presumably (for whatever reason) treating all earlier records as planted.
2. Listed as casual by Kent.
3. Kent does not mention *Juglans regia*. The tree Johnson recorded in Tottenham is discussed in the text.
4. Kent wrote 'Probably an error', but it is difficult to find reasons to doubt Johnson's record.
5. 'Probably always planted', according to Kent.
6. Kent omitted lichens, though Trimen and Dyer (1869) included a short Appendix on them by J. M. Crombie.

APPENDIX

Johnson's *Catalogus* of 1638, with modern botanical names added

Catalogus Plantarum juxta
Tottenham lectarum
Anno Dom.
1638.

Absinthium vulgare latifolium. *Common Wormewood* [*Artemisia absinthium*]
Acanthium. *Matth. Dod. Lob.* Spina alba syl, *Fuchs. The Cotton Thistle.* [*Onopordum acanthium*]
Acer minus. *The Common Maple.* [*Acer campestre*]
Acer majus, sive Platanus Scotica *Cardani. The great Maple, commonly called the Sycamore.* [*Acer pseudoplatanus*]
Acetosa, sive Oxalis vulgaris. *Sorrel.* [*Rumex acetosa*]
Acetosa sive Oxalis minima Tragi, *Dod.* minor, *Matth.* Ovina *Tab. Sheepes sorrell.* [*Rumex acetosella*]
Acorus nostras palustris *Lob.* Iris palustris lutea, *Tab.* Pseudo iris, *Dod. Yellow Water Flower de luce. Water-flagges.* [*Iris pseudacorus*]
Agrifolium. *Dod.* Aquifolium *Matth.* &c. *Holly* [*Ilex aquifolium*]
Alliaria, *Trag. Matth. Fuchs.* Pes asini, *Pandectarii. Jack by the hedge. Sauce alone.* [*Alliaria petiolata*]
Alnus vulgaris, *Tragi, Matth. Dod. The Alder.* [*Alnus glutinosa*]

2

Alsine media. *Dod. Ger. Middle Chickweed* [*Stellaria media*]
Alsine minor multicaulis. *Bauh.*minima. *Dod. Fine Chickweed.* On the cross. [*Arenaria serpyllifolia* s.l.]
Alsine foliis Veronicæ. *Tab. Ger.* Alysson. *Col. Speedwell Chickweed.* [*Veronica arvensis*]
Alsine hederacea, *Tab. Ger.* Morsus gallinæ folio hederulæ, *Lob. Ivy chickweed or small Henbit.* [*Veronica hederifolia*]
Anagallis mas flore phæniceo. *Male red Pimpernel.* [*Anagallis arvensis* ssp. *arvensis*]
Anagallis aquatica vulgaris, sive Becabunga. *Offic. Brooklime.* [*Veronica beccabunga*]
Anchusa degener facie Milii solis, *Lob.* Lithospermum syl. *Trag. Bastard Grommell, Salferne.* [*Lithospermum arvense*]
Antirrhinum arvense minimum. *Thal. Cam. Little Snapdragon.* [*Chaenorhinum minus*]
Aparine. *Goosegrasse. Clivers.* [*Galium aparine*]
Aracus sive Cracca major. *Lob. Ger. Strangle-Tare, or wilde Fetch.* [*Vicia sativa* ssp. *nigra*]
Aracus, sive Cracca minima. *Small wilde Tare.* [*Vicia hirsuta*]
Argemone capitulo longiore, *Lob. Long roughheaded Poppye.* [*Papaver argemone*]
Argentina, *Dod. Lob.*Anserina *Tragi. Silverweed.* [*Potentilla anserina*]
Armerius syl. *Dod.* Armeria pratens. syl. *Lob.* Flos Cuculi pratensis. *Trag.* Car. pratensis. *Tab. Wilde Williams.* [*Silene flos-cuculi*]

3

Artemisia vulgaris. *Mugwort.* [*Artemisia vulgaris*]
Arum vulgare. *Wake Robin. Cuckow-Pinte.* [*Arum maculatum*]
Arundo vulgaris, vallatoria *Lob.* palustris, *Matth. Common reede.* [*Phragmites australis*]
Atriplex olida *Lob.* Canina, *Trag.* Garosmum, *Dod. Stinking Orach, or Notchweed.* [*Chenopodium vulvaria*]
Atriplex angusto oblongo fol. sive sylvestris Polygoni aut Helxines folio, *Lob. Narrow-leaved Orach.* [*Atriplex patula*]
Atriplex sylvestris vulgaris *Ger. Common wild Orach.* [*Chenopodium album*]
Atriplex sylvestris latifolia *Lob.* Pes anserinus *Fuch. Dod.* Chenopodium 1. *Tab. Goosefoote or Sowbane.* [*Chenopodium murale*]
Barbarea, Pseudobunias *Lob.* Nasturtium hybernum, *Quorundam. Winter cresses.* [*Barbarea vulgaris*]

Bardana, sive Lappa major, Personata *Fuch. Lob. Great Burdocke.* [*Arctium lappa* or *A. minus*]
Bellis minor vulgaris, consolida min. *Quorundam. Little Daisyes.* [*Bellis perennis*]
Bellis major, *Trag. Matth.* Consolida media vulnerariorum. *Great Daisyes or Oxeyeye* [sic] [*Leucanthemum vulgare*]

4

Betulus *Lob.* Carpinus *Matth.* Ostrys Theophrasti, *Clus. The Hornebeame tree.* [*Carpinus betulus*]
Blattaria major flore luteo, sive Blattaria Plinii, *Lob. Great Moth Mullein.* [*Verbascum blattaria*]
Bonus Henricus, *Trag.* &c *Common Mercurie, All-good.* [*Chenopodium bonus-henricus*]
Bryonia alba, *Dod.* Vitis alba, *Matth. White Bryonie.* [*Bryonia dioica*]
Bryonia nigra, Sigillum beatæ Mariæ, *Offic.* Tamus, *Dod. Black Bryonie.* [*Tamus communis*]
Buglossa sylvestris minor. *Dod. Ger. emac.* Echium germanicum spinosum, *Fuch.* Borago sylvestris, *Trag. Small wilde Buglosse.* [*Anchusa arvensis*]
Bugula *Dod. Lob.* Consolida media *Matth. Fuch. Tab. Bugle.* [*Ajuga reptans*]
Bulbocastanon *Dod.* Nucula terrestris septentrionalium, *Lob. Earth-nut, or Ear-nut.* [*Conopodium majus*]
Bursa pastoris major. *Sheepheards Purse.* [*Capsella bursa-pastoris*]
Bursa pastoris minor. *Little Sheepeheards Purse.* [*Teesdalia nudicaulis*]
Buxus. *Boxe.* [*Buxus sempervirens*]
Calamintha aquatica, *Matth.* Polycnemon Lobelii, *Lugd. Water Calamint.* [*Mentha arvensis*]

5

Caltha palustris, *Dod. Lob.* Tussilago altera, *Matth. Marsh Marigold.* [*Caltha palustris*]
Cannabis spuria, flo. albo. Lamium *Quorund. Wilde Hempe.* [*Galeopsis tetrahit* s.l.]
Cannabis spuria altera flo. purp. *Nettle Hempe.* [perhaps the same]
Cardamine, *Ger.* altera, *Lob.* Nasturtium pratense *Trag.* Flos cuculi, *Dod.* Sisymbrium aquat. alterum, *Matth. Lady-smocke, or Cuckow floure.* [*Cardamine pratensis*]
Carduus stellatus, *Dod.* sive Calcitrapa *ejusdem et Lob. Star-thistle.* [*Centaurea calcitrapa*]
Carduus spinosissimus vulgaris, *Lob.* Aculeosa Gazæ. *Adv.* Polyacanthos Theophrasti, *Tab. Thistle upon Thistle* [*Carduus crispus*]
Carduus spinosissimus, capitulis minoribus sive Polyacantha *Lob. Small welted Thistle.* [*Carduus tenuiflorus*]
Carduus spinosissimus altissimus, forte Carduus palustris, *Bauh. Tall Heath thistle.* [*Cirsium palustre*]
Carduus lacteus *Matth.* Mariæ *Trag. Fuch.* Silybum *Ang.* Leucographis Plinii, *Lugd. Milke Thistle.* [*Silybum marianum*]
Carduus vulgatissimus radice repenti, κεανόθσ Theophrasti, *Col. The way Thistle.* [*Cirsium arvense*]
Caryophyllata vulgaris, Herba benedicta *Brunf.* Geum *Turn. Avenes. Herbe Bennet.* [*Geum urbanum*]

6

Carpinus *Matth.* Ornus, *Tragi.* Ostrys Theophrasti, *Clus.* Betulus *Lob. Hornebeame tree.* [*Carpinus betulus* again]
Castanea vulgaris. *Chestnut tree.* [*Castanea sativa*]
Catanance, *Quorundum.* Ervum syl. *Dod. Crimson grasse Fetche.* [*Lathyrus nissolia*]
Caucalis minor flosculis rubentibus, *Ger. emac. Hedge parsley.* [*Torilis japonica*]
Centaurium minus vulgare fl. albis. *Lesser Centory with white flowers.* [*Centaurium erythraea*]
Cerasus sylvestris. *Wilde Cherry tree.* [*Prunus avium*]
Chamæmelum vulgare. *Chamomill.* [*Chamaemelum nobile*]
Chelidonium majus. *Great Celandine.* [*Chelidonium majus*]
Chelidonium minus, sive Scrophularia minor. *Pilewort.* [*Ficaria verna*]
Chrysanthemum segetum, *Lob. Clus.* Bellis major lutea, *Trag. Corne Marigold or Goldes.* [*Glebionis segetum*]
Cichoreum syl. flore cæruleo. *Wilde Succory.* [*Cichorium intybus*]
Cicuta vulgaris, copiose. *Hemlock.* [*Conium maculatum*]
Cicutaria alba Lugd, palustris flore candido *Cam.* Myrrhis syl. *Fuch. Wilde Cicely.* [*Anthriscus sylvestris*]
Conyza media *Matth.* Calaminthæ 3 genus, *Fuch. Middle Fleawort, or Fleabane.* [*Pulicaria dysenterica*]

7

Consolida major, sive symphytum majus flo. albo, *Great Comfrey.* [*Symphytum officinale*]
Consolida major, sive symphytum major flore purpureo. *Great Comfrey with purple flowres.* [the same]
Convolvulus major flo. albo. Volubilis major, *Tab. Trag.* Smilax lævis. *Matth. Dod. Great Bindweede.* [*Calystegia sepium*]
Convolvulus minor flo. purpureo. *Lob.* Volubilis minor *Trag.* Helxine cissampelos, *Matth. Fuch.* Smilax lævis minor, *Lob. Small Bindweede.* [*Convolvulus arvensis*]
Cornu cervinum, *Offic.* Coronopus, sive herba stella, *Matth. Lob. Harts-horne, or Buck-horne Plantaine.* [*Plantago coronopus*]
Cornus fœmina, *Lob. Tab.* Virga sanguinea *Matth. Dod. Dogge tree.* [*Cornus sanguinea*]
Coronopus Ruellii, cornu Cervi alterum vulgi, *Lob. Dod.* Ambrosia *Matth. Swines cresses.* [*Lepidium coronopus*]
Corylus sylvestris, *Trag. Matth.* Nux avellana sylvestris *Fuch. Dod. Hazle nut tree.* [*Corylus avellana*]
Cotyledon aquatica, sive acris septentrionalium, *Lob. White-rot, Water Pennywort.* [*Hydrocotyle vulgaris*]
Cotula alba *Dod.* fœtida *Lob.* Parthenium *Fuch. Tab. Mayweede.* [*Anthemis cotula*]
Cruciata *Dod.* minor, *Lob.* Gallium.2. *Trag Crossewort.* [*Cruciata laevipes*]
Cyanus minor vulgaris, *Matth. Lob.* Baptisecula *Trag. Blew-bottle.* [*Centaurea cyanus*]

8

Cynocrambe, Mercurialis syl. mas & fœmina. *Dogges-mercury.* [*Mercurialis perennis*]
Cyperus gramineus miliaceus, *Lob. Ger. emac. Millet Cyperus grasse.* [*Scirpus sylvaticus*]
Daucus vulgaris. *Offic.* Pastinaca syl. tenuifolia, *Dod. Ger. Wilde Carrot, Bees nest.* [*Daucus carota*]
Dens Leonis, Caput Monachi, &c. *Dandelion. Pissabed.* [*Taraxacum* spp.]
Dipsacus vulgaris, Labrum Veneris. *Wilde Teasell.* [*Dipsacus fullonum*]
Dipsacus minor, sive Virga pastoris, *Matth. Sheepheards rod.* [*Dipsacus pilosus*]
Elatine Diosc, sive Veronica Fœmina, *Fuch. Dod. Female Fluellin or Speedwell.* [*Kickxia spuria* [1]]
Equisetum nudum *Ger.* Junceum, *Trag. Naked Horse-taile.* [*Equisetum fluviatile*]
Equisetum arvense longioribus setis, sive segetale, *Ger. Corne Horse-taile.* [*Equisetum arvense*]
Equisetum fœtidum sub aquis repens *Bauh. Stinking water Horse-taile.* [*Chara* spp.]

9

Esula exigua. *Trag. Lob. Ger. emac. Dwarfe Spurge.* [*Euphorbia exigua*]
Euonymus Theophrasti. *Lob. Dod.* Carpinus *Trag. Spindle tree.* [*Euonymus europaeus*]
Eupatorium cannabinum mas; vulgare, *Matth. Dod.* Herba S. Kunigundis, *Trag. Water hempe or hempe Agrimony.* [*Eupatorium cannabinum*]
Eupatorium cannabinum fœm. Septentrionalium, *Lob.* Hepatorium aquatile *Dod.* Verbena supina *Trag. Bastard Agrimony.* [*Bidens tripartita*]
Euphrasia vulgaris, sive alba, *Dod. Eyebright.* [*Euphrasia* spp.]
Faba minor vulgaris, Boona sive Phaselus minor, *Dod. Common Beanes.* [*Vicia faba*]
Fagus. *The Beech tree.* [*Fagus sylvatica*]
Festuca & Avena Græca. *Lob.* [2] Bromos sterilis *Ger.* Ægilops 1. *Matth. Tab. Wilde Oates.* [*Anisantha sterilis*]
Filix mas non ramosa, pinnulis latis densis minutim incisis. *Ger. emac.* Filix mas, *Matth. Fuch. Dod. Common Male fern.* [*Dryopteris filix-mas*]
Fragaria minime vesca, sive sterilis *Lob. Ger. Barren Strawberry.* [*Potentilla sterilis*]
Fraxinus vulgaris *The Ash tree.* [*Fraxinus excelsior*]

10

Fumaria vulgaris *Fumitory.* [*Fumaria* spp.]
Galeopsis *Diosc, Clus.* Urtica herculea, *Tab. Trag. Hedge-nettle.* [*Stachys sylvatica*]
Gallium album, *Tab. Ger.* palustre *Dod. White flowred Ladyes Bedstraw.* [*Galium palustre*]
Gallium luteum, *Lob. Ger. Ladyes Bedstraw &c.* [*Galium verum*]
Genista vulgaris. *Common Broome.* [*Cytisus scoparius*]
Genista spinosa vulgaris. *Furze, Whin, Gorsse.* [*Ulex europaeus*]
Geranium arvense *Tab.* Gruinum *Dod.* Cicutæ folio *Bauh. Unsavoury field Cranesbill.* [*Erodium cicutarium*]

Geranium columbinum, sive Pes Columbinus, *Dod. Lob.* Geranium 2. *Diosc. Trag. Doves-foote.* [*Geranium molle*]
Geranium Rupertianum, sive herba Roberti, *Herbe Robert.* [*Geranium robertianum*]
Glastum, Isatis. *Woade.* [*Isatis tinctoria*]
Gnaphalium vulgare, Filago, Centunculus, Herba impia. *Cudweed, or Cotton weed.* [*Filago vulgaris* [3]]
Gramen pratense vulgare. *Lob. Ger. Meadow-grasse.* [*Poa pratensis* s.l.]
Gramen pratense paniculatum molle. *Bauh.* lanatum *Dalesch. Hoary Meadow-grasse.* [*Holcus lanatus*]

11

Gramen caninum vulgare. *Common Dogges-grasse.* [*Elytrigia repens*]
Gramen agrorum latiore arundinacea & comosa panicula, sive Agrorum venti spica *Lob. Reed-grasse, Bents, Windle Straw.* [*Apera spica-venti*]
Gramen junceum, *Ger.* Bufonium, *Tab. Rush, or Toad –grasse.* [*Juncus bufonius*]
Gramen majus aquaticum. *Great water grasse.* [*Glyceria maxima*]
Gramen arundinaceum paniculatum, sive Calamagrostis. *Sherre-grasse. Wilde reed.* [*Calamagrostis epigejos*]
Gramen Alopecurinum majus, *Ger. Great Bastard Foxtaile grasse.* [*Alopecurus pratensis*]
Gramen typhoides, sive typhinum minus *Ger. Small Cats-taile grasse.* [*Phleum bertolonii*]
Gramen typhoides spica longissima. *Bauh. Long-eared Cats-taile grasse.* [*Phleum pratense*]
Gramen fluviatile. *Ger. Floate-grasse.* [*Glyceria fluitans*]
Gramen spica secalina. *Rie-grasse.* [*Hordeum secalinum*]
Gramen pratense cristatum. *Bauh. Cox-combe grasse.* [*Cynosurus cristatus*]
Gramen murorum spica longissima. *Capons tail grasse.* [*Vulpia myuros*]
Gramen palustre cyperoides, *Lob. Ger. Great Cyperus grasse.* [*Carex otrubae*]
Gramen cyperoides parvum. *Small Cyperus grasse.* [*Carex muricata* agg.]
Gramen cyperoides angustifolium majus spicis erectis. *Great narrow-leaved Cyperus grasse.* [*Carex nigra* agg.[4]]

12

Gramen cyperoides spicis pendulis, Pseudocyperus, *Lob. Dod. Bastard Cyperus.* [*Carex pseudocyperus*]
Hedera arborea, sive Corymbosa communis. *Climbing Ivy.* [*Hedera helix*]
Hedera helix, sive sterilis. *Barren or creeping Ivy.* [*Hedera helix*]
Hedera terrestris, Chamæcissos, *Ground Ivy, Ale-hoofe.* [*Glechoma hederacea*]
Hieracium minus præmorsa radice. *Lob.* minus sive Leporinum, *Ger.* Lactuca leporina *Trag. Hares lettice, Yellow Devills bit.* [*Scorzoneroides autumnalis*]
Hieracium foliis & facie Chondrillæ, *Lob.* Aphacoides *Ger. Succory Hawkweed.* [*Crepis capillaris*]
Hieracium macrorhizon, *Tab.* sive longius radicatum, *Lob. Ger. Long-rooted Hawke-weed.* [*Hypochaeris radicata*]
Hieracium dentis leonis folio hirsutum. *Ger. emac. Dandelion Hawke-weed.* [*Leontodon hispidus*]
Holostium vernum fine majae [sic], Euphrasia gramen, *Trag.* Gramen *Fuch.* alterum, *Matth.* Leucanthemum. *Dod.* Holostium Ruellii, *Lob. Stitchwort with large flowres.* [*Stellaria holostea*]
Holostium alterum flo. minore. *Stitchwort with lesser flowres.* [*Stellaria graminea*]
Hordeum spontaneum spurium, Holcus Plinii, *Anguill. Wall Barley, or Wilde Rye.* [*Hordeum murinum*]

13

Hordeum distichon. *Common Barley.* [*Hordeum distichon*]
Hyacinthus Anglicus vulgaris, *Ger. Harebells.* [*Hyacinthoides non-scripta*]
Hyoscyamus niger vulgaris. Apollinaris, Alturcum. *Hen-bane.* [*Hyoscyamus niger*]
Hypericum vulgare, Perforata, Fuga dæmonum. *S^t^ Johnswort.* [*Hypericum perforatum*]
Jacea nigra vulgaris. *Knapweed, Mate Fellon.* [*Centaurea nigra* s.l.]
Jacea foliis dissectis, flo. albo. *White Knapweed.* [*Centaurea scabiosa*]
Jacobæa major vulgaris, Senecio major, *Matth. Great Raggewort, Seggrum.* [*Senecio jacobaea*]
Irio sive Erysimum *Diosc. Lob. Banke-Cresses.* [*Sisymbrium officinale*]
Juglans, sive Nux regia. *The Walnut tree.* [*Juglans regia*]
Juncus acutus vulgaris sive panicula sparsa. *Hard rush.* [*Juncus inflexus*]

Juncus sive Scirpus medius, sylvaticus *Tab. The lesser Bull-rush.* [*Schoenoplecctus tabernaemontani* [5]]
Juncus lævis glomerato flore, *Lob. Smooth round headed Rush.* [*Juncus conglomeratus*]

14

Lactuca agnina, *Ger.* Olus album, *Dod. Lambes lettice, Corne sallade.* [*Valerianella locusta*]
Lactuca syl. foliis dissectis, sive sylvestris, *Matth. Fuch.* Seris domestica. *Lob. Cut-leaved wilde Lettice.* [*Lactuca serriola* forma *serriola*]
Ladanum segetum Plinii, & Tetrahit angustifolium aliis, *Lugd.* Alyssum Galeni flore purpureo. *Tab. Narrow leaved All heale.* [*Galeopsis angustifolia*]
Lamium rubrum, *Ger.* Urtica non mordax foetens purpurea, *Lob. Red Archangell.* [*Lamium purpureum*]
Lamium vulgare flo. albo. *Archangell, Dead Nettle.* [*Lamium album*]
Lampsana, *Lob.* Sonchus sylvaticus, *Tab.* Papillaris, *Cam. Dock-cresses, Tetterwort.* [*Lapsana communis*]
Lapathum acutum. *Ger. Sharp pointed Dock.* [*Rumex crispus* [6]]
Lapathum aquaticum, sive Hydrolapathum majus, *Great Water Dock.* [*Rumex hydrolapathum*]
Lathyrus sylvestris flo. luteis, *Thalius.* Vicia, *Tab.* Legumen terræ glandibus simile *Dod.* Aphacoides, *Quorund. Tare everlasting.* [*Lathryus pratensis*]
Lens palustris. *Water lentill, Ducks-meate.* [*Lemna minor*]
Leucoium luteum, Viola lutea, *Trag.* Keiri vel Cheiri, *Offic. Wall flowre.* [*Erysimum cheiri*]

15

Lichen arborum, sive Pulmonaria, *Trag. Matth. Fuch. Dod. Tree Lungwort.* [A foliose lichen [7]]
Ligustrum vulgare. *Privet.* [*Ligustrum vulgare*]
Linaria vulgaris flo. luteo, Osyris, *Matth. Fuch. Toadflax.* [*Linaria vulgaris*]
Linum vulgare sativum. *Common Flax or Line.* [*Linum usitatissimum*]
Lithospermum majus, sive Milium solis. *Offic. Gromwill.* [*Lithospermum officinale*]
Lolium album. *Ger.* Triticum temulentum. *Lob. Ad. Darnell, Ray-grasse.* [*Lolium temulentum*]
Lolium rub. *Ger.* Phœnix *Matth. Dod.* Hordeum murinum Plinii, *Lob. Tab. Red Darnell grasse.* [*Lolium perenne*]
Lupulus salictarius, sive Lupus salictarius, Plinii, *Lob. Dod. Hopps.* [*Humulus lupulus*]
Lychnis sylvestris fl. rubello, forte Hesperis Theophrasti, *Lob.* Ocimastrum, sive Ocimoides, *Matth.* Melandrium Plinii; *Clus.* Saponaria hirsuta. *Italis. Wilde red rose Campion.* [*Silene dioica*]
Lychnis sylvestris flo. albo. *Wilde white Rose Campion.* [*Silene latifolia*]
Lychnis segetum parva viscosa flore albo. Alsine spuria 4. *Dod.* Alsine viscaria. *Cam. Mouse-eare Campion or Catchfly Campion.* [*Cerastium glomeratum*]
Lysimachia siliquosa hirsuta magno flor. *Bauh.* Purpurea 1, *Fuch. Great codded Willow-herbe.* [*Epilobium hirsutum*]

16

Lysimachia siliquosa hirsuta parvo flore. *Small flowred Willow-herbe.* [*Epilobium parviflorum*]
Lysimachia spicata purpurea, forte Plinii. *Spiked Willow-herbe.* [*Lythrum salicaria*]
Lysimachea cærulea, galericulata, *Lob.* Gratiola cærulea, *Quorund.* Tertianaria, *Tab. Hooded Willow-herbe or Loose-strife.* [*Scutellaria galericulata*]
Malva vulgaris procerior, *Lob. Dod.* major, *Tab. Common Mallow.* [*Malva sylvestris*]
Malva sylvestris pumila, *Fuch. Dod.* repens pumila. *Lob. Dwarfe Mallow.* [*Malva neglecta*]
Malus sylvestris. *Crab tree.* [*Malus sylvestris*]
Melilotus. *Offic.* Sertula campana Plinii, Lotus Urbana. *Matth. Melilote.* [*Melilotus altissimus*]
Menthastrum *Trag. Matth.* Mentha equina *Brunfels. Horsemint.* [*Mentha* × *villosa* [8]]
Mentha aquatica sive Sisymbrium, *Fuch. Dod.* Balsamita vel Balsamine, *Offic. Water-mint.* [*Mentha aquatica*]
Mercurialis testiculata, sive mas. *Diosc. Plin. Matth. Male Mercury.* [*Mercurialis annua* (♀)]

17

Mercurialis spicata, sive Fœmina, *Diosc. Plin. Matth. Female Mercury.* Along with the former on a dung-hill plentifully. [*Mercurialis annua* (♂)]
Millefolium vulgare album, terrestre majus *Tab.* Stratiotes millefolia *Fuch.* Achillea. *Dod. Common Milfoil or Yarrow.* [*Achillea millefolium*]

Millefolium vulgare flore diluti ruboris *Trag.* purpureum *Lob. Dod. Tab. Red flowred Milfoile or Yarrow.* It differs from the former in colour only. [*Achillea millefolium*]

Millefolium sive Maratriphyllum flore & semine Ranunculi Aguas. Hepaticæ facie. *Ger.* Fœniculum aquaticum 3. *Tab. Water Fennell, Crow-foote Milfoile.* [*Ranunculus trichophyllus* [9]]

Morsus Ranæ *Dod. Lob. Frogge-bit.* [*Hydrocharis morsus-ranae*]

Muscus pyxoides, sive pyxidatus, *Ger. Cuppe Moss.* [*Cladonia* spp.[10]]

Muscus arboreus, *Trag. Matth. Dod.* Quernus *Lob. Ger. Tree Mosse.* [*Usnea* spp.[11]]

Myosotis scorpioides arvensis hirsuta. *Adv. Lob.* Auricula murus cærulea *Tab. Mouse-eare Scorpion grasse.* [*Myosotis arvensis*]

Myosotis scorpioides palustris, Euphrasia cærulea. *Trag. Tab.* Heliotropium minus in palustribus, *Cæsalp.* Echium palustre, Cordi, *Thal. Water scorpion grasse.* [*Myosotis scorpioides*]

18

Napus, Bunias. *Fuch. Dod. Wilde Navew.* [*Brassica rapa*]

Nummularia vulgaris, sive major lutea. *Yellow money-wort, or herbe Two-pence.* [*Lysimachia nummularia*]

Nymphæa alba major. *Great white water Lilly.* [*Nymphaea alba*]

Nymphæa lutea major. *Great yellow water Lilly.* [*Nuphar lutea*]

Oenanthe aquatica, *Lob.* Filipendula aquat. *Ger.* Juncus odoratus aquat. *Dod. Water Dropwort.* [*Oenanthe fistulosa*]

Orchis palmata pratensis maculata, *Bauh.* Palmata Christi fœm. *Ger.* Satyrium basilicum fœm. *Dod. Female Satyrion royall.* [*Dactylorhiza fuchsii*]

Oxycantha *Matth. Lob.* Spina appendix Plinii, *Ger. White- or Haw-thorne-tree.* [*Crataegus monogyna* agg.[12]]

Oxycanthus Galeni, *Cam.* Crespinus, *Matth.* Barbaris *Offic. Barberries.* [*Berberis vulgaris*]

19

Papaver Rhoeas. *Lob. Ger.* Erraticum. *Matth. Dod. Red Poppy.* [*Papaver rhoeas*]

Papaver erraticum alternum, *Fuch. Dod.* erraticum minus. *Tab. Little red Poppy, or Corne Rose.* [*Papaver dubium* [13]]

Paronychia vulgaris *Dod.* alsinefolia, *Lob.* Bursa pastoris 6. *Trag. Chickweed Whitlow grasse.* [*Erophila verna* s.l.]

Paronychia altera, *Dod.* rutaceo folio, *Lob.* Alsine petræa rubra & Paronychia 3. *Tab. Rue Whitlow-grasse.* [*Saxifraga tridactylites*]

Parthenium. *Matth.* Matricaria *Dod. Lob.* Artemisia tenuifolia *Fuch. Tab. Feverfew.* [*Tanacetum parthenium*]

Pecten Veneris, *Matth. Ger.* Scandix *Dod. Sheepheardes Needle, Venus Combe.* [*Scandix pecten-veneris*]

Pedicularis pratensis lutea, sive Crista galli herbariorum, *Lob. Yellow Rattle or Cockescombe.* [*Rhinanthus minor*]

Pentaphyllum, sive Quinquefolium vulgare, *Common Cinquefoile.* [*Potentilla reptans*]

Perchpier Anglorum, *Lob. Ger. emac.* Alchemilla montana, *Col. Parsley Breakestone* [*Aphanes arvensis* s.l.]

Persicaria mitis maculosa; *Lob. Ger.* altera, *Trag. Matth. Dead, or spotted Arsmarte.* [*Persicaria maculosa*]

20

Persicaria urens, *Lob.* Hydropiper. *Matth. Fuch. Dod.* Arsmarte, Water pepper. [*Persicaria hydropiper*]

Periclymenum *Trag. Fuch.* non perfoliatum septentr. *Lob.* Caprifolium, Matrisylva, *Offic. Dod. Woodbine, Hony-suckle.* [*Lonicera periclymenon*]

Phalaris sativa, *Matth. Dod. Lob.* Semen Canariense vulgi. *Canary seede.* [*Phalaris canariensis*]

Phalaris pratensis minor. *Lob.* Gramen leporinum & tremulum. *Tab. Quaking grasse, Cowquakes.* [*Briza media*]

Phyllitis. *Matth. Dod.* Lingua cervina, *Offic.* Scolopendrium. *Brunfels. Hartstongue.* [*Asplenium scolopendrium*]

Pilosella siliquata, *Thal.* Paronychia altera Myagri folio, *Ger. Codded Mouse-eare.* [*Arabidopsis thaliana*]

Pimpinella sanguisorba major, *Matth. Great Burnet.* [*Sanguisorba officinalis*]

Pisum arvense. *Field Pease.* [*Pisum sativum*]

Plantago major latifolia vulgaris. *Great Plantaine or Waybreed.* [*Plantago major*]

Plantago minor angustifolia, 5-nervia, *Lob. Ger.* lanceolata *Trag. Tab. Ribwort.* [*Plantago lanceolata*]

Plantago aquatica major, Limonium verum, *Diosc. Great Water Plantaine.* [*Alisma plantago-aquatica*]

21

Polygonum mas vulgare. Centinodia. *Common Knot-grasse.* [*Polygonum aviculare* s.l.]
Polypodium vulgare. *Polypody.* [*Polypodium vulgare* s.l.]
Populus nigra vulgaris. *Blacke Poplar.* [*Populus nigra*]
Populus tremula, Lybica. *Matth. &c. The Aspen-tree.* [*Populus tremula*]
Potamogeton latifolium. *Pond-weed.* [*Potamogeton natans*]
Potamogeton angustifolium. *Narrow-leaved Pond-weed.* [*Persicaria amphibia*]
Potamogeton perfoliatum, sive 3. *Dod. Small Pondweed.* [*Potamogeton perfoliatus*]
Primula veris, sive Primula sylvarum, *Lob.* Alisma sylvarum, *Col. Primrose.* [*Primula vulgaris*]
Primula pratensis, herba Paralysis, *Offic.* Alisma pratorum, *Col. Cowslips.* [*Primula veris*]
Prunella vulgaris *Trag.* Consolida minor. *Matth. Selfe-heale.* [*Prunella vulgaris*]
Prunus silv. fructu majore. *The Bullas-tree.* [*Prunus domestica* ssp. *insititia*]
Prunus silv. fructu minore. *The sloe-tree, or Black-thorne.* [*Prunus spinosa*]
Pseudomelanthium, *Matth.* Nigellastrum *Dod.* Lychnis segetum sive arvensis *Tab.* Githago; *Trag. Cockle.* [*Agrostemma githago*]
Ptarmica vulgaris, *Lob.* Pyrethrum sylv. *Dod.* Tanacetum album, *Trag. Sneese-wort.* [*Achillea ptarmica*]

22

Pulegium vulgare, sive mas. *Penni-royall, Pudding grasse.* [*Mentha pulegium*]
Quercus vulgaris. *The Oake-tree.* [*Quercus robur*]
Ranunculus auricomus, *Lob.* dulcis, *Trag. Goldylockes Crowfoote.* [*Ranunculus auricomus*]
Ranunculus arvensis echinatus, *Bauh.* Arvorum, *Lob. Rough-headed Crowfoote.* [*Ranunculus arvensis*]
Ranunculus aquatilis, *Dod. Ger.* aquatilis hepaticæ facie, *Lob.* Polyanthemum aquaticum vel palustre, *Dod. Water Crow-foote.* [*Ranunculus aquatilis*]
Ranunculus aquaticus lanceatus major, *Tab.* Flammeus major *Ger. Great Speare-wort.* [*Ranunculus lingua*]
Ranunculus aquatilis angustifolius, *Lob.* Flammeus minor *Ger.* Flammula, *Dod. The lesser Speare-wort.* [*Ranunculus flammula*]
Ranunculus bulbosus *Lob. Round-rooted Crowfoote.* [*Ranunculus bulbosus*]
Ranunculus pratensis maculatus surrectis cauliculis, *Lob. Ger. Tall meadow Crowfoote.* [*Ranunculus acris*]
Ranunculus pratensis hirsutus reptante cauliculo, *Lob.* Pratensis etiamq; hortensis, *Ger. Common Crow-foote, or Butter cups.* [*Ranunculus repens*]

23

Rapistrum arvorum, *Lob. Ger.* Sinapi agreste 4. *Trag. Charlock.* [*Sinapis arvensis*]
Rosa sylv. *Matth. Dod.* Cynosbatos, *Diosc. Adv.* Cynorrhodos, *Plinii.* Canina, *Cam. The Briar, or Dogges Rose.* [*Rosa canina*]
Rosa sylv. pomifera, *Lob.* Rosa arvina, *Tab.* Pimpinellæ folio, *Ger. Pimpernell Rose.* [*Rosa pimpinellifolia*]
Rubeola arvensis repens cærulea, *Bauh.* Rubeola arvensis, *Cam. Little field madder.* [*Sherardia arvensis*]
Rubus vulgaris fructu nigro. *Bramble- or Black-berry bush.* [*Rubus fruticosus* agg.]
Sagittaria major, *Matth. Dod.* Sagittaria aquat. *Plin.* Pistana Magonis, *Lob. Broad Arrow-head.* [*Sagittaria sagittifolia*]
Salix vulgaris arborescens &c. *The Common Willow.* [*Salix* spp.]
Salix humilis angustifolia, Ὀίσος, *Theophr.* Viminalis *Dod.* amerina, *Plin. The Oysier.* [*Salix viminalis*]
Salix caprea rotundifolia *Tab. Ger. Round-leaved Sallow.* [*Salix caprea*]

24

Salvia agrestis, Salvia bosci, Scorodonia, *Woodsage.* [*Teucrium scorodonia*]
Sambucus vulgaris. *Elder, Hiller, Bore tree.* [*Sambucus nigra*]
Saponaria *Lob. Dod. Ger.* Struthium sativum *Fuch. Sope-wort.* [*Saponaria officinalis*]
Scabiosa major vulgaris. *Common Scabious.* [*Knautia arvensis*]
Scrophularia major, *Lob.* Ocymastrum alterum *Trag. Browne-wort.* [*Scrophularia nodosa*]
Sedum, Aizoon, Sempervivum majus vulgare. *Great Housleeke or Sengreene.* [*Sempervivum tectorum*]

Sedum medium teretifolium, *Lob. Ger. Prick-madame.* [*Sedum album*]
Sedum sive Sempervivum minimum acre. Illecebra, *Offic.* Sedum 3 *Diosc. Stonecrop.* [*Sedum acre*]
Senecio, sive Erigeron vulgare, Carduncellus. *Groundsell.* [*Senecio vulgaris*]
Sinapi sativum vulgare. *Common Mustard.* [*Brassica nigra*]
Sium Cratevæ Erucæfolium. *Lob.* Nasturtium aquaticum. *Offic. Common Water cresses.* [*Nasturtium officinale* s.l.]
Solanum, sive Solatrum vulgare, hortense, *Matth. Dod. Lob. Nightshade.* [*Solanum nigrum*]
Solanum lignosum, sive Dulcamara, *Dod. Trag. Bitter Sweete.* [*Solanum dulcamara*]

25

Sonchus asper vulgi, *Lob. Prickly Sow-thistle.* [*Sonchus asper*]
Sonchus lævis laciniatus vulgaris, Lactuca leporina [14], *Lob. Common Sowthistle.* [*Sonchus oleraceus*]
Sophia Chirurgorum, *Dod. Lob.* Nasturtium syl. *Fuch.* Thalictrum *Tab. Flix-weede.* [*Descurainia sophia*]
Sorbus sylvestris Alpina, *Lob.* Ornus *Dod.* Sorbus aucuparia, *Quorund. Quicken-tree, Roane-tree.* [*Sorbus aucuparia*]
Sorbus, Aria cognominata, *Clus.* Sorbus pilosa, *Gesn.* Aria Theophrasti effigie Alni *Lob. The White Beame tree.* [*Sorbus aria*]
Sparganium ramosum *Matth. Lob. Ger.* Platanaria *Dod. Burre-flagge, or branched Burre-reede.* [*Sparganium erectum*]
Spergula vulgaris flo. albo, sive Saginæ Spergula *Lob.* Anthylloides *Thal.* Alsine terrestris altera, τριχοφυλλος *Col. Spurry.* [*Spergula arvensis*]
Sphondylium vulgare hirsutum, Acanthus germanica, sive vulgaris *Fuch.* Branca ursina *Trag. Cow Parsnep.* [*Heracleum sphondylium*]
Tanacetum vulgare luteum, Artemisia monoclonos sive tenuifolia, *Fuch.* Artemisia Dioscoridis, *Tab. Tansie.* [*Tanacetum vulgare*]
Thlaspi vulgare, *Offic.* Vaccariæ fol. *Lob. Mithridate Mustard.* [*Lepidium campestre*]

26

Thlaspi Dioscoridis, Drabæ aut Camelinæ folio, *Lob. Ger. Treacle Mustard, Penny-cresse.* [*Thlaspi arvense*]
Tithymalus helioscopius. *Matth. Fuch. Lob. Ger. Sunne Spurge.* [*Euphorbia helioscopia*]
Tragopogoon vulgare, sive luteum, *Lob.* Barbulæ hirci, *Trag. Matth. Go to bed at noone.* [*Tragopogon pratensis*]
Trifolium pratense album. *Fuch. Dod. White-flowred Trefoile.* [*Trifolium repens*]
Trifolium pratense purpureum vulgatissimum. *Common Trefoile, or three-leaved grasse.* [*Trifolium pratense*]
Trifolium fragiferum, *Clus. Ger. emac.* Vesicarium, *Quorund. Bladder trefoile.* [*Trifolium fragiferum*]
Trifolium luteum, vel agrarium, *Dod.* Luteum alterum lupulinum, sive Lupulus sylvaticus, *Thal. Ger. emac. Hop-Trefoile.* [*Trifolium campestre*]
Tussilago, Bechion, Farfara, Ungula caballina. *Coltes-foote.* [*Tussilago farfara*]
Typha palustris, *Cord. Dod. Cats-taile, Reed-mase.* [*Typha latifolia*]
Valeriana, sive Phu majus syl. *Dod.* palustris, *Cam. Great water Valerian.* [*Valeriana officinalis*]

27

Verbena communis. *Vervaine.* [*Verbena officinalis*]
Veronica pratensis, *Dod.* minor *Tab.* Betonica Pauli, *Quorundam. Little Fluellin.* [*Veronica serpyllifolia*]
Viburnum, *Matth. Wayfairing tree, Cotton tree.* [*Viburnum lantana*]
Vicia vulgaris, vel sativa, *Common Vetch, or Fetch.* [*Vicia sativa* ssp. *sativa* [15]]
Viola purpurea sive Martia vulgaris, *Purple or March Violet.* [*Viola odorata*]
Viola serotina sive canina, *Dogges Violet.* [*Viola* spp.[16]]
Viola, sive Jacea tricolor sylv. parva. *Wilde Pansies.* [*Viola tricolor*]
Ulmaria, Regina prati, *Dod.* Barba capri *Lob. Meade-sweete.* [*Filipendula ulmaria*]
Ulmus vulgaris folio lato scabro. *The Common Elm tree.* [*Ulmus procera*]
Urtica vulgaris urens, *Trag.* Urtica foemina communis, *Dod. Common Nettle.* [*Urtica dioica*]

Notes:

1. Kent interpreted this as *Kickxia elatine* but Johnson's synonyms indicate *K. spuria*.
2. *Lob.* (for L'Obel) should read *Lon.* (for Adam Lonicer: *Kreuterbuch,* 1582). This is possibly the only significant transcription error in the whole document.
3. Kent identified this as *Gnaphalium uliginosum* though Johnson's names refer to *Filago vulgaris*, for which Kent gave *c.*1730 as the earliest record.
4. Oswald and Preston (2011) tentatively identify this sedge as a tall member of the *Carex nigra* group (*C. acuta* or *C. elata*).
5. In his edition of Gerard, Johnson described and illustrated 'Juncus aquaticus maximus, Great Water-rush, or Bul-rush' which is *Schoenoplectus palustris*. Here he follows earlier authorities in carefully distinguishing a smaller but similar plant which can only be *S. tabernaemontanii*. His would appear to be the first British record, preceding that of Ray (1696: 273) who used the same names as Johnson. See Oswald and Preston (2011) for a further discussion of this identification.
6. Kent identified this as *Rumex conglomeratus*. During his excursions to Kent Johnson recorded both 'Lapathum acutum vulgare' (1629) and 'Lapathum acutum minimum *Lob.*' (1629 and 1632). Gilmour (1972) interpreted these as, most likely, *R. crispus* and *R. conglomeratus* respectively, and Johnson's treatment in Gerard (1633), including the accurate illustrations he chose, bears this out. Thus, I take this to be *R. crispus*.
7. The names refer to *Lobulatia pulmonaria* which is very rare in eastern England. It is an indicator of ancient woodland and may have grown on the trees in Tottenham Wood (off the map to the west). More likely Johnson recorded a different foliose lichen such as *Parmelia*. Ray (1660) gave a similar record for Cambridgeshire which Oswald and Preston (2011) interpret as referring to foliose lichens in general.
8. *Mentha longifolia*, the true horse mint, does not occur in Britain. Plants so named in Johnson's time are almost unidentifiable, but *M.* × *villosa* (*M. spicata* × *suaveolens*) is the most likely.
9. Watercrowfoots are difficult, but Oswald and Preston (2011) show convincingly that this is the plant so named by Ray.
10. Crombie, in Trimen and Dyer (1869), recorded *Cladonia pyxidata* as 'not uncommon on heaths', and it may be this.
11. I follow Oswald and Preston (2011) in identifying Johnson's 'Tree Mosse' as a fruticose lichen, probably a species of *Usnea*.
12. *Crataegus monogyna* and *C. laevigata* were not distinguished in Johnson's time.
13. The identity of Johnson's 'Little red Poppy', clearly distinct in his mind from *Papaver rhoeas,* seems clear enough, though the first British record of *P. dubium* is generally attributed to Ray (1696).
14. The name 'Lactuca leporina' was taken by L'Obel from Tragus who applied it to *Scorzoneroides autumnalis*; it is used by Johnson for that plant in this list. Presumably its appearance here, for *Sonchus oleraceus*, is a mistake.
15. Oswald and Preston (2011) discuss the possibility that ssp. *segetalis* might also have been grown at that time.
16. This could be *Viola riviniana* or (less likely), *V. reichenbachiana*; they were not separated for a further two hundred years. *V. canina* is very unlikely.

Book review

John James Laforest Audubon: an English perspective. Christine E. Jackson. Published privately by the author. 2013. xxi, 234 pp., large quarto, hardback. £40 + £6.50 p. & p.; signed quarter leather edition £75 + p. & p. £6.50. No ISBN. Available from C. E. Jackson, Tanglewood, Burton Green, Withersfield, Suffolk CB9 7SB; tel. 01440 708662; email cejacksonbirdart @waitrose.com

There cannot be many bird lovers, ornithologists or general naturalists who have not heard of Audubon and seen postcards or larger reproductions of some of the species illustrated in *The Birds of America*. When this appeared in four volumes from 1827–1838 it was the largest bird book ever published, 38″ × 29″, and with 435 coloured plates. The illustrations of life-size figures were aquatinted and printed in London by Robert Havell. And it was to seek subscribers for the publication of this monumental work that Audubon travelled to England on four occasions, October 1826 to April 1829, April 1830 to July 1831, May 1834 to September 1836, and August 1837 to July 1839. Publishing a book in Britain in the 1820s and 1830s was a mammoth task for an author, especially one not known on this side of the Atlantic. Christine Jackson describes in fascinating detail how Audubon not only contrived to fit the birds onto the plates, but also how very subtly he managed to show their salient features.

But why did he travel to England in the first place? The simple answer was that American publishers could not cope with his huge drawings, and his advisers told him that England was where he would find an experienced engraver. So, why not France? Audubon's first language was French, and some beautiful colour, engraved bird books had been issued in France across the turn of the century. But those days had gone. France was impoverished by the Revolution, followed by the Napoleonic wars. Britain was in the ascendancy, and as Audubon no longer thought of himself as French, he took out American citizenship before embarking for England.

Audubon journeyed backwards and forwards across the country in his quest for subscribers. He visited Liverpool and Manchester early on and although he knew he had to go to London to get his work published, 'he put if off because he was frightened by the immensity of the city and more than a little daunted by having to find someone to do the work on *The Birds of America*. Instead he decided to go to Edinburgh for a short visit.'

The chapter devoted to London describes how Audubon was able to meet many of the leading scientists, influential aristocrats and wealthy landowners. His first impression of London was 'Edinburgh is a Mere village compared with this Vasty Capital — the Duke of Bedford owns several streets himself that would cover Louisville entirely.'

In the short time since this book appeared, it has not been possible to more than skim through it. What is so rewarding in reading such a book as this about a famous naturalist is the way their life and work are so closely linked to the people and events of the times, their impressions of the many areas visited, the circle of people they encountered, scientists, statesmen, royalty, and so on. It all falls into context, so what better way can there be of learning history?

K. H. Hyatt

Does anything support your records?

JAMES WEARN

Herbarium, Library, Art and Archives Directorate, Royal Botanic Gardens, Kew, Richmond, Surrey TW20 3AE

Abstract

Naturalists, largely beyond their hours of employment, have been recording the wildlife of Britain for centuries, and this activity has added greatly to our knowledge of biodiversity, whilst providing valuable data from which conservation assessments and policies have been created to safeguard it. Although records have been relatively forthcoming, support for them in terms of material evidence has often been lacking. The topic of voucher specimen collection affects everyone engaged in natural history and other biological disciplines yet it has been considered a 'delicate subject' and is seldom highlighted, outside academia, at any length or with much potency. In this article, I provide a commentary on the significance and sporadic collection of voucher specimens, as well as consideration of current and future trends and needs.

What are voucher specimens?

Most readers will be familiar with the term 'voucher specimen' but, for clarity, a definition is a useful place to begin. A voucher in its broadest sense is 'a piece of evidence' (Chambers English Dictionary) and for biological purposes can be defined as *a specimen that serves as proof of existence, and which is retained in evidence as a point of reference*. However, Kageyama et al. (2007) proposed a revised concept, based on two categories of evidence, each of comparable importance — specimens being primary vouchers, and derived products, special preparations and documentation becoming secondary vouchers. This updated classification of vouchers incorporates parts of specimens which are commonly preserved in processed forms such as DNA extracts, microscopical slides or frozen tissues.

Why do we need vouchers?

Having defined the subject, I now open this overview with a quotation on which the discussion that follows is based. A decade ago, Charles Pettitt of Manchester Museum stated that 'maps of rare and critical species can be reliably prepared only from museum (voucher) specimens. Reliable maps of common species need voucher specimens . . . many erroneous records are found'. He continued, 'unfortunately some important recent publications on local authority nature conservation have failed to remark the importance of voucher specimens and reference collections' (Pettitt 1991). His remarks still carry much weight today because voucher specimens continue to be undervalued in their critical role as assets at the foundations of recording and conserving wildlife. Indeed, I had been astonished and rather disconcerted on

reading an article entitled 'Where now for taxonomy?' which appeared a year earlier in the prestigious journal *Nature* (Clifford et al. 1990), suggesting 'the case for destroying most specimens used in revisional studies or lodged as ecological vouchers is strong' — perhaps accepted to propagate debate rather than due to its scientific merit (although its tenet was supported to varying degrees by others, e.g. Hedberg and Walters 1996). Fortunately, these authors' conclusions were strongly and widely disputed, which was borne out by the content of the numerous replies that were included in the subsequent volume under the heading 'In defence of taxonomy' and more recent rebuttals (e.g. Cotterill (1999) who stated that ' "overduplication" is a non-concept', and Cotterill et al. (2008)). However, whilst the topic is certainly not new, it continues to sit on a back burner in many biodiversity recording circles.

Mabberley (1995) talked about the organisms around us being 'snapshots' of continuous evolution, and emphasized the importance of a long-term and holistic viewpoint. Material evidence of these snapshots is captured in voucher specimens. This material is the only verifiable proof of the existence of a particular organism at a given time in any one locality and, through suitable accession in a museum or herbarium collection (though many collections are 'private', see below), it is then available for reassessment whenever taxonomic circumscriptions are modified to reflect advances in organismal research (e.g. Bebber et al. 2010).

Morphological, phenological, biochemical, genetic and distribution data yielded from vouchers are critically important to assessments of taxonomic, phylogenetic and evolutionary placement of organisms, elucidation of patterns of genetic variation within and among populations, creation of conservation assessments and red lists of threatened species, law enforcement, and evaluation of all derived agricultural, ethnological and medicinal uses (e.g. Schlick-Steiner et al. 2003; Brown et al. 2009; Brock et al. 2009; Nesbitt et al. 2010). In our changing environment, vouchers are also essential for an accurate study of biological responses to climate change and pollution (Anon. 2005). Furthermore, material collected as part of one study may be used synergistically in research with a very different focus. For example, plants collected during botanical exploration, and later consulted by entomologists and mycologists have subsequently yielded new records and new species of plant-associated organisms (including galls, see examples cited in Mabberley et al. 1995; Crane 2005). Vouchers, therefore, permit interdisciplinary advances and should promote collaboration.

Vouchers require removal of organisms, or at least parts of them, from their natural environment (and therefore, from the breeding population). Therefore, sensitivity must be exercised when assessing collection of material. For example, Rich and Jermy (1998) stated that 'a single fertile pinna' would suffice when providing a voucher from a fern species of conservation importance, while Slade (1998) wrote that far more moths are killed by vehicular encounters than for scientific study. I include Slade's remark in an attempt to demonstrate that collection, when carried out responsibly, furthers our understanding of population trends and interactions between organisms, without damaging populations. Indeed, alongside the development of conservation ethics and discouragement of gathering specimens, the rise of a fear of collection has ensued (e.g. Clement 2000). The need for removal of plant material from the country of origin now elicits a multitude of permission requirements relating to genetic resource management issues, the Convention on Biological Diversity

(CBD), the Convention on International Trade in Endangered Species (CITES) and guidelines for collection from the International Union for Conservation of Nature (IUCN). Here, I am considering only material collected in and held within UK borders, and so collection of specimens that have not been listed on UK Red Lists or Biodiversity Action Plans nor are present in protected sites, generally only requires landowner permission. However, the practical aspects of collection, including new laws governing the carrying of sharp instruments, is another matter.

The phrase 'no voucher, no transaction' is as equally applicable to scientific records as it is to purchases on the high street. Barkworth and Jacobs (2001) went as far as to state that an absence of vouchers from papers is 'sometimes so serious that such papers should have been rejected'. This is undoubtedly true, and so, with respect to organism-based data — if you cannot prove it, no one can use it.

Patchy recognition of voucher importance

Non-collection and/or non-deposition of voucher specimens is a problem that exists globally, and is still prevalent (especially outside purely taxonomic research) — a deficit which has been lamented on many occasions (e.g. Piippo et al. 2002; Legon and Henrici 2005; Łuczaj 2010). Funk et al. (2005) highlighted a major historical inadequacy concerning the absence of vouchers for the majority of chromosome counts performed before 1965, which had made the data 'essentially worthless' because the identities of these plants were unverifiable. Reviews of voucher creation and related data handling have been published in academic books and journals (Wheeler 2003; Nesbitt et al. 2010) but the trickle-down effect has been sporadic, though a few authors have adopted a sensible approach whereby species records that are not supported by vouchers are listed, but highlighted as such, and omitted from any analyses (e.g. Bain and Hurley 2011). Whilst a lack of voucher specimens to support records in the UK is not a new problem (for example, nineteenth and early twentieth-century unsupported records have been discussed by Hofmann et al. 1990 and Lockton and Whild 2006), the importance of voucher specimens has never made it to the forefront of biodiversity recording and conservation in Britain.

Some species are more difficult to identify than others — a phenomenon occurring across all groups of organisms — and so, one would infer that collection of specimens which cannot be readily identified in the field is more important for certain insects, plants and so forth, than for others (examples are illustrated in Figures 1–4). Within their own fields of expertise, some specialists have attempted to suggest examples or collate numbers of 'difficult taxa' in Britain for which collection of specimens is essential (e.g. Slade 1998; Roper 2008; Ellis and Walker 2011).

Standpoints concerning the submission of records with or without voucher support vary widely between organized groups within Britain, as do verification procedures. For example, The Shropshire Botanical Society has an uncompromising perspective on charophytes (stoneworts) because they are difficult to identify and due to significant recent taxonomic changes (Stewart and Lockton (2001): 'we do not accept any records without a voucher specimen') whilst the Ephemeroptera Recording Scheme *requires* voucher specimens only for records from new and unusual localities (e.g. *Nigrobaetis niger* [a UK Priority Species] records from Ireland, see

FIGURE 1. A rather stern-looking *Nomada flavopicta* (nomad bee), pinned in a voucher collection (image: Malcolm Storey, www.bioimages.org.uk).

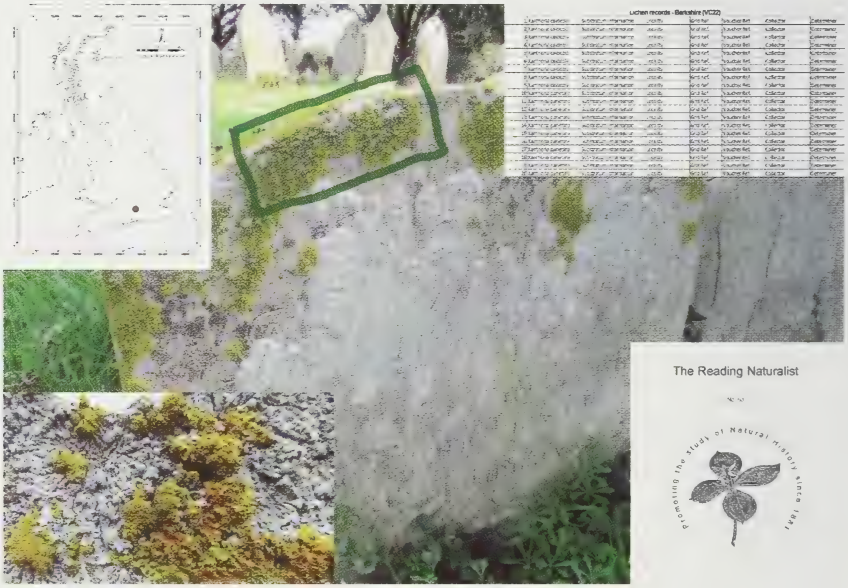

FIGURE 2. Elements of a complete record for a churchyard lichen – an *in situ* photograph is accompanied by a record data sheet, voucher specimen, locality map and publication of the record by the county recorder (image: James Wearn).

FIGURE 3. Century-old voucher specimens of plants such as the non-native *Pilosella aurantiaca* are still shedding light on population trends and species variation (field images: Malcolm Storey, www.bioimages.org.uk; herbarium sheet image: James Wearn).

FIGURE 4. A voucher specimen of *Subclytia rotundiventris*, a scarce parasitoid fly with a distribution largely within southern England, occasionally northwards to the Midlands. This one was collected in Dorset in 2011 (image: Malcolm Storey, www.bioimages.org.uk).

www.ephemeroptera.org.uk). The *Plant Crib*, produced by the Botanical Society of the British Isles (BSBI) to aid identification of difficult taxa (Rich and Jermy 1998), and now largely available online (see www.bsbi.org.uk), recommends the collection of vouchers, while the National Biodiversity Network's (NBN) data archiving webpage (NBN 2011) states that vouchers are necessary and that their acquisition requires promotion — though neither highlights their importance in 'neon lights', as should be the case when such a major change in the *status quo* is needed. Nevertheless, more common is the lack of any mention of vouchers on organizations' websites, bulletins and other outputs, hence, many new county records still lack vouchers. David Allen, a well-known commentator on British natural history and a prolific author on the study of the history of the subject, recently showed his concern for this trend in his response to a request from the BSBI for comments regarding the publication *BSBI Recorder* (reported in Pearman et al. 2007).

A report in 2006 stated that there were '92 specialist natural history recording schemes and societies in the UK' (Grove-White et al. 2007), and there are currently 1,565 entries in *Nature Societies Online*, the directory of British and Irish natural history and related societies accessible via the Natural History Museum's website (www.nhm.ac.uk). However, as noted by Boxshall and Self (2011: 7), only a small subset of these groups actually undertakes taxonomic research. These range from the British Simuliid Group (devoted to the study of blackflies, with 100 members internationally, www.blackfly.org.uk) through the BSBI (2,760 members in 2011, Gwynn Ellis pers. comm.) to Butterfly Conservation (*c.*18,000 members and growing, www.butterfly-conservation.org). In Britain there are now over 100,000 citizens involved in natural history related activities of some sort (Gillett and Lawrence 2003) — a massive source of support for British wildlife which should not be underestimated (and is now being appreciated more fully, see below). However, the majority of the smaller, local and regional groups, appear to have no formal standpoint, and it is often up to the discretion of individual recorders to adopt their own procedures and to make suggestions to those from whom they receive records.

Housing and finding voucher specimens

In the UK, there are numerous collections, large and small, containing all manner of specimens and ancillary materials, but finding them is not always easy. In the field of botany, finding local herbaria has been greatly enhanced by the index of British and Irish herbaria (Kent and Allen 1984, with additions in Allen 2000). Entomologists, for example, currently lack such an invaluable resource, although Robinson (2008*b*) provided a summary of the main UK insect collections. Groups of organisms which have generally received less attention throughout recording history, such as fungi and lichens, are deposited much more sporadically outside the main national repositories of the Natural History Museum London (**BM**), Royal Botanic Gardens Kew (**K**), Royal Botanic Garden Edinburgh (**E**), National Museums and Galleries of Wales (**NMW**) and the Ulster Museum (**BEL**), resulting from a few local specialist collectors' donations (e.g. the Humphrey Bowen lichen collection in Reading Museum, Berkshire) or sales (e.g. John Malloch's Diptera collection in Glasgow Museum).

Private collections of voucher specimens, amassed by hobbyist naturalists, are often not easily accessible, being housed in the homes of county recorders and other local experts. Recorders often need to keep material easily to hand as

a reference for their own future records, much of it having been verified by other experts. Good links with professionals and other recorders is essential (for verification of identifications). Specimens (or duplicates) of first records, at least, should always be deposited at a recognized institution as soon as possible so that maximal benefit is derived from them. Most institutions are happy to receive new specimens, although institutional scope, specimen value, and cost of housing are significant considerations. For non-historical collections, one has to provide evidence of lawful collection.

There is a trade-off between the need for a personal reference collection, for use by the recorders themselves (as well as their own material for use in educational workshops, exhibits and so on, which would not be allowed on loan from a museum to an individual) and wider accessibility in the public domain. Nevertheless, any private collection should be publicized within the relevant research community, and notes of the whereabouts of vouchers must be passed on together with records, so that they may be consulted at any future time. Vouchers in private collections, which have not already been donated to an institution (local museums are often more appropriate than national ones due to relevance and volumes of material) need to be included in bequests to secure their future (Taylor 1988). Many have succumbed to auction sales, bonfires, or have been tossed aside, thought worthless and subsequently found in lofts, and even in pigsties! Vouchers in private collections generally also lack the environmentally controlled and pest-limited storage conditions of those held in recognized facilities and are, therefore, more liable to enhanced degradation.

Returning to the poignant *Nature* paper by Clifford et al. (1990), the challenge of securing sufficient resources (space, funds, and so forth) for housing and maintenance of these bundles of voucher specimens is an ever-burning issue, at all scales (local, regional and national).

Where do we go from here?

When entering into any discussion of British biodiversity recording, two things must be borne in mind: (1) by far the majority of wildlife recording in Britain, both historically and today, is a result of unpaid enthusiasts (whether they are called 'hobbyists' or 'amateurs', though the latter is a frequently misused term as, for example, the *Amateurs as Experts* project and the *UK Taxonomy and Systematics Review* have shown (Grove-White et al. 2007; Boxshall and Self 2011), and (2) unlike formally trained and employed professional biologists (*sensu lato*), who generally adhere to defined protocols for collection and dissemination of biodiversity information, hobbyist naturalists have, for a long time, lacked such a framework. This situation has been exacerbated by a misperception (especially by non collections-based scientific disciplines and governmental bodies) of natural history, museum collections and herbaria as superfluous to modern science, and therefore sidelined, with concomitantly declining government funding. Additionally, historic and modern data sets often lack sufficient notes or locality precision, hampering modelling of population trends for conservation assessments, etc. (e.g. Rich and Karran 2006), so we must be sure to collect enough data in order to yield anything worthwhile.

It is one thing to acknowledge a deficit but quite another to tackle it, so before turning our attention to voucher specimens per se, it is important not to forget that the information which these collections support (the records) also remains held within local organizations rather than being streamed upwards to regional, national (and international, where relevant) levels. Equally, the

submission of biodiversity records to national databases is frequently underplayed, and can be increased with appropriate support. The collection and submission of biodiversity records and voucher specimens should, logically, go hand-in-hand, yet the former outstrips the latter. The skill set is generally not lacking within enthusiast groups, though considerate support is needed to ensure that formalization of recording procedures does not cause disincentivisation of the record creators.

Whilst the transfer and dissemination of records are substantial subjects deserving separate discussion, the 2008 House of Lords inquiry into the state of taxonomy and systematics in the UK and Natural England's Review of Local Biodiversity Record Centres (LRCs) have identified shortfalls in community engagement, record dissemination, and training (capacity building). Natural England's review of LRCs (during which, in 2010, I sat on the steering group for the Regional Review for the South East), aimed to discuss relationships with data providers; raising the profile of LRCs and working towards sustainable funding; and developing tools for improvement of record collection, analysis and availability (e.g. Lush et al. 2007; Wearn 2011). The workshops facilitated interactions between members of LRCs, the NBN, record creators and end users in order to share needs and desires to enhance throughput and output. In combination with the activities of other high-profile educational and support centres like the Angela Marmont Centre at the Natural History Museum in London (and the recent Open Air Laboratories project, or OPAL), encouragement of 'citizen science' by provision of a multi-directional framework for distribution of information and support promises to boost interest in, and support for the studying and recording of British wildlife.

As computer technology develops more and more use can be made of vouchers and their associated data. Renewed studies of accessioned vouchers has allowed modelling of morphological characters for renewed species delimitations, and global positioning systems (GPS) now allow accurate mapping of historical and modern collections. Increasingly electronically mobilized, the general public are producing an abundance of new records from digital image captures (not only from digital cameras but also via smartphone technology) — so called 'crowd sourcing'. Availability of GPS-linked image sharing repositories, from broad spectrum sites like flickr (www.flickr.com) to more specialist ones such as iNaturalist (www.inaturalist.org) and iSpot (www.ispot.org.uk), are rapidly producing an abundance of new records from members of the general public (GBIF 2011). These specialist sites integrate biodiversity data repositories including the NBN, nationally, and the Global Biodiversity Information Facility (GBIF), internationally, to provide a more complete resource. Furthermore, development of verification tools like DAISY (Digital Automated Identification System, NHM London) aims to provide authenticated identifications using image recognition software, through the use of artificial intelligence to sample a bank of electronic stock images, DNA sequences or sounds. However, the true identity of very many species, in Britain and globally, cannot be accurately determined by the use of a photograph (though mammals, birds, reptiles and other larger organisms usually can be identified by photos or tracks). Therefore, over-reliance on new public-sourced records yielded through the 'modern technology craze' (which are also unlikely to be supported by vouchers), could have dire consequences for population mapping and conservation assessments.

The NBN has recently developed a Record Cleaner tool to help to improve the quality of British wildlife records. Beyond format validation, this software is able to check if the locality is unexpected (of an organism outside its currently known range or season, for example) and there is scope for tailoring the verification to specialist groups of organisms. This is advantageous by allowing extraordinary records to be 'flagged' for confirmation by other means. Clearly, the Record Cleaner cannot provide definite confirmation/refutation with regard to organismal taxonomy, being limited to theoretical suggestions based on existing data, and that is why voucher specimens are never superfluous.

Although there are thousands of naturalists active in Britain, interest and expertise is highly skewed. Certain groups of organisms have suffered a loss of recorders as well as national expertise (e.g. field mycology) and there is an urgent need to replace lost talent (Francis Rose in my region!). For example, in 2009 there were vacancies in Cheshire for county recorders of lichens and molluscs. Now 2013, these roles are still empty and there are additional gaps in coverage of Diptera, fungi and mites. This county is by no means peculiar in this respect. A renewed thrust towards attraction and education of specialists for under-recorded groups is gaining momentum through public engagement activities (examples include the Open Air Laboratories (OPAL) earthworm and lichen surveys: collaborations between the NHM London, and the Earthworm Society of Britain, and British Lichen Society, respectively).

Conclusion

Robinson (2008*a*), in a report on Heritage Lottery Fund-supported apprenticeships for new generations of naturalists, aptly referred to the extant majority as 'older beasts with a grey pelage' — a reminder that unless we continue to pass on our knowledge and enthusiasm at every opportunity, there could be an abrupt halt to these activities. Development of a robust and functional, national to local network linking recorders, data users, educators and policy makers is now essential to ensure that British wildlife receives adequate recognition and protection.

'Biodiversity information' is a subject of several elements (observations, vouchers, data handling, policy making, and interactive support), each of which needs to be closely linked if data is to (a) be valid, and (b) pass efficiently from source to user. Field observations are incredibly useful for directing attention to habitats and species which may need to become conservation priorities, but such records, in time, become 'stagnant data', especially as taxonomy is updated, because they cannot be conclusively verified without return visits to the site(s). Physical voucher specimens allow confirmation (or otherwise) of species presence at a particular time. Where vouchering is not practical or unadvisable due to conservation needs, observational records must be supported by strong locality information (preferably georeferenced) and field notes. Currently, insufficient resources are available for databasing and digitizing all voucher collections at local, regional and national collections — a fact which is not likely to alter significantly in the near future. Therefore, it is essential to ensure that both hobbyist naturalists and employed scientists are able to find the reference collections that they need. Recently, there has been renewed emphasis on 'handling bioinformatics' at national and international scales. Nevertheless, we must not lose sight of the *validity* of the fundamental units that underpin bioinformatics — the records.

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Book review

Fauna cantabrigiensis. The vertebrate and molluscan fauna of Cambridgeshire by the Rev. Leonard Jenyns (1800–1893): transcript and commentaries. Edited by Richard C. Preece and Tim H. Sparks. The Ray Society, London 2012. 226 pp., A4 hardback, £65 (less to Ray Society members). ISBN 978 0 903874 44 1.

The Ray Society was founded in 1844 and among its stated aims is the publication of books on natural history, not exclusively of the British Isles, but especially works of scientific significance which might not otherwise be commercially viable. The present volume is number 174 of the series of which the first was published in 1845. Last year (*LN* **91**) we reviewed a new, full translation from the Latin of *John Ray's Cambridge catalogue (1660),* the earliest flora of an English county. Although the present volume also deals only with Cambridgeshire, the picture that emerges can be regarded as a microcosm of the situation in other counties in south-east England for which far less information exists from this early period. In passing, the same can be said of numbers of papers in this journal over the years that have made in-depth analyses of early works, especially in botany and entomology.

In 2005 (*LN* **84**) we were privileged to be able to review *Leonard Jenyns. Darwin's lifelong friend,* published by The Bath Royal Literary and Scientific Institution; a detailed life of Jenyns. Now, *Fauna cantabrigiensis* makes a most invaluable contribution to the natural history of Cambridgeshire, and the editors have provided modern commentaries comparing the mammals, birds, reptiles, amphibians and molluscs found in the county in Jenyns's day with the present. In his introductory 'Notice' of January 1869 in his notebook, Jenyns explains his plan for the manuscript to be an accompaniment to the collections in the Museum of the University of Cambridge. He called it 'Collections towards a Fauna Cantabrigiensis', pointing out that 'In fact it is little more than a Catalogue of such Animals, occurring in the County, as had come to my knowledge up to the period of my leaving it in 1849', and adding later that 'this work is little more than a List of names and localities'. However, like Gilbert White, whose *Natural History of Selborne* Jenyns had devoured when he went to Eton aged thirteen, Jenyns recorded every aspect of the natural history including meteorology and also what we today call phenology. His area of coverage is biased towards localities close to his home at Swaffham Bulbeck or his favourite fenland sites within easy reach.

The editors have enlisted the help of other specialists to provide modern commentaries on the groups described and the result is a most absorbing account of a section of Cambridgeshire natural history as it was in the first half of the nineteenth century. The comparisons with today will strike a chord with all who feel for our changing environment and wish we had been there with these pioneering naturalists. A fascinating read not to be rushed through.

But, if Leonard Jenyns had been able when invited in 1831 to accompany Captain Robert Fitzroy as naturalist to go round the world with him on HMS *Beagle,* what would the outcome have been . . . ?

It is hoped that Jenyns's *Entomologia Cantabrigiensis* will be published soon.

Details of membership of The Ray Society (Registered Charity No. 208082) may be obtained by writing to The Honorary Secretary, The Ray Society, c/o Natural History Museum, London SW7 5BD.

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K. H. Hyatt

The wildlife of the south-east London suburb of Charlton

JOHN F. BURTON
In der Etzwiese 2, D-69181 Leimen-St. Ilgen, Germany
johnfburton@gmx.de

Abstract

A largely personal, anecdotal, and descriptive account, not purporting to be a comprehensive scientific treatise, is presented of the wildlife of the London suburb of Charlton, within the Borough of Greenwich, both before its engulfment from about 1880 by the spread outwards from London of urbanization and industrialization, and during the residence there of the author from 1943 to 1959. Additional notes on wildlife observed since 1959 by the author and others are also given.

Introduction

Over the years 1943 to 1959, when I lived in Charlton, I contributed many of my observations on the wildlife of the district to *The London Naturalist, London Bird Report* and J. M. Chalmers-Hunt's *The Butterflies and Moths of Kent* (1960–1981). However, it seems worthwhile to draw them together with the observations of others in this article, the last in a series I have contributed to this journal on the wildlife of particular areas within the Borough of Greenwich (Burton 1992, 2001, 2008*a*, *b*; Burton and Freed 2009). At the same time I have attempted to give a word picture from contemporary accounts of the Charlton district before it became industrialized and urbanized after about 1880.

Charlton lies on the northern slopes of a gravel plateau approximately seven miles (eleven kilometres) from St Paul's Cathedral, within the Borough of Greenwich, and bordered to the north by the River Thames, to the east by the Borough of Woolwich, to the south by Blackheath and Kidbrooke, to the south-west by the Borough of Lewisham, and to the north-west by Greenwich proper (Figures 1 and 2). Listed in the Domesday Book of 1086 as *Cerletone*, a name formed from the Old English 'ceorl' and 'tin', which means 'farmstead of the freemen or peasants' (Wikipedia), it survived as a rural village surrounded

FIGURE 1. Rural Charlton prior to about 1800.

Woodland

Parkland

Marsh grassland and commonland

Farmland

Tidal mud

Buildings

Roads and tracks

1. Greenwich Park
2. Blackheath
3. Wricklemarsh Estate
4. Westcombe and Woodlands Estates
5. Comb (Eastcombe) Farm
6. Charlton Village
7. Charlton House and Park
8. Hanging Wood
9. Charlton Common
10. Woolwich Common
11. Woolwich Dockyard
12. Eltham Common

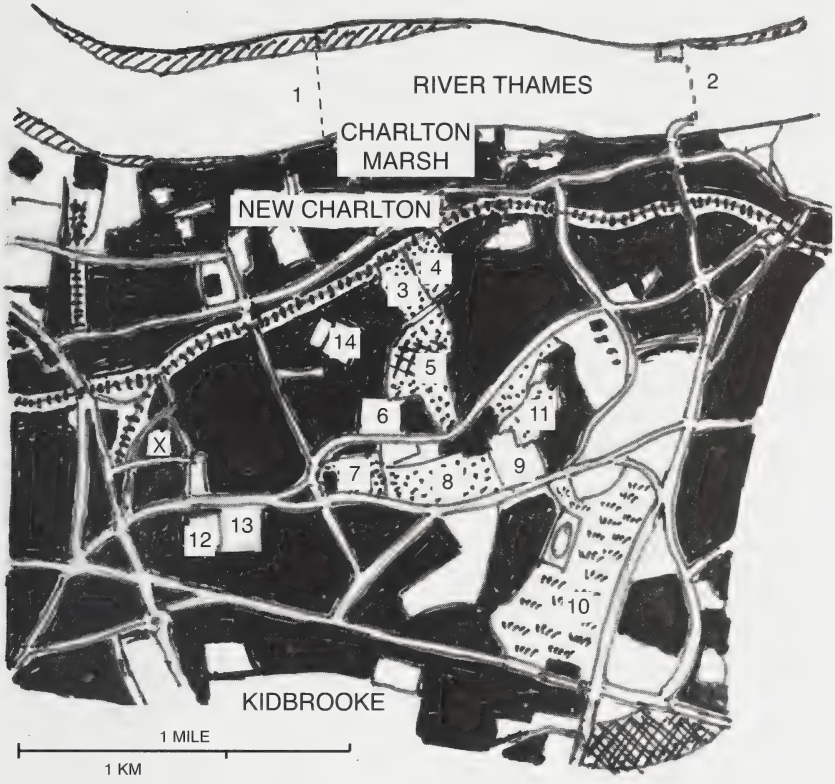

FIGURE 2. Urbanized Charlton after 1880.

X Position of author's home, 1943–1959

Woodland

Parkland

Rough grassland

Sports fields and other unbuilt-upon land

Tidal mud

Buildings

Railway

Roads and tracks

1. Thames flood barrier
2. Woolwich Ferry crossing
3. Gilbert's Pit SSSI (Charlton Sandpit)
4. Maryon Park
5. Maryon-Wilson Park (formerly Hanging Wood)
6. Charlton Village
7. Charlton House and gardens
8. Charlton Park
9. Charlton Cemetery
10. Woolwich Common
11. Woolwich Royal Military Repository and lake
12. The Rectory Field (Blackheath Rugby Club)
13. The Cherry Orchard
14. Charlton Athletic's stadium 'The Valley'

by pleasant countryside until about 1880, by which time the portion bordering the Thames became known as New Charlton. Charlton Village today retains the title by right of 'village' and lies astride the Charlton Road from London and Blackheath to Woolwich. In many repects it has changed little today from its appearance in the nineteenth century. It is overlooked by its parish church of St Luke, originally dating from the fifteenth century. Among the village's four main pubs is an old coaching inn, *The Bugle Horn,* opposite the church, both of which once bordered the formerly extensive village green (Greenwich Borough Council 1951). Southwards, the village extends, with fine views over the Thames and the Thames Barrier in Woolwich Reach, down a steep hillside via Charlton Church Lane to Charlton Marsh in New Charlton. Present-day Charlton extends westwards through built-up areas towards the Royal Standard shopping area at the edge of Blackheath; north-eastwards downhill to the centre of Woolwich and east-south-eastwards towards the lofty prominence of Shooters Hill (130 metres above sea level). Approaching Charlton Village from the west one is confronted on the right-hand side by the imposing and highly attractive seventeenth-century Jacobean Charlton House, the former manor house home of the Maryon-Wilson family until 1915. The family's estate included Charlton Park, extending eastwards from the house, and Hanging Wood (now Maryon and Maryon-Wilson Parks) and the large chalk- and sand-pits on the north side of the village. In 1925 Charlton House and its estate were sold to Greenwich Borough Council and the London County Council. Much of the estate was then opened to the public as Charlton Park and Maryon-Wilson Park. Previously, in 1889, Sir S. Maryon-Wilson had presented twelve acres in the northernmost part of the Hanging Wood to the London County Council who opened it to the public as Maryon Park in 1891.

Because of these parks, as late as the early 1920s much of eastern Charlton had an almost rural appearance and, to some extent, remains so today. After a visit to Charlton in 1653, the diarist John Evelyn described the prospect from Charlton House as 'one of the most noble in the world, for city, river, ships, meadows, hill, woods and all other amenities' (Greenwich Borough Council 1951). Hanging Wood (Figure 3), a prominent natural feature, so-called because it clothed the hillside, retained much of its character in its new form as Maryon-Wilson Park. On the other hand, Maryon Park (Figure 4), also once part of Hanging Wood, except for its western wooded slopes, which formed part of the ancient Romano-British camp, became, however, much more like a typical urban park. Apart from the very attractive adjacent gardens of Charlton House, Charlton Park, with its sports facilities, although pleasant, is also characteristically urban.

Before 1880, Charlton outside the Maryon-Wilson estate, consisted chiefly of hillside farmland with fields bounded by hedgerows with majestic trees growing in them, scattered orchards and the occasional copse. In the west these formed part of the Westcombe and Woodlands estates. The former included Westcombe Farm and the latter Comb(e) Farm, whose lands extended northwards to the river bank. The ancient manor of Westcombe (West Combe or Coombe) was once in the gift of King Richard II (1367–1400) who granted it to Robert Ballard (Richardson 1834). About 1718 it was purchased by Sir Gregory Page who leased it to a Captain Walpole; he demolished the old manor house and built a new mansion near by. Equally ancient was the manor of East Combe (Coombe), which in 1613 was settled on Queen Anne of Denmark for life. After her death it was leased by the Crown to a succession of

private families (Richardson 1834). Both these manor estates were sold for housing development in 1876. The 'Woodlands' estate villa (completed in 1774 for the landowner, John Julius Angerstein, a Russian émigré) survives today in the ownership of Greenwich Borough Council. Daniel Lysons (1796), in writing that it occupies an 'uncommonly beautiful' situation amid very picturesque scenery, gives us today an idea of how lovely the Charlton and Greenwich countryside once was. In 1834 Henry S. Richardson (1834) described 'Woodlands' as 'a neat substantial building' whose 'grounds are very extensive, containing a great variety of exotic and other plants,' and commanding 'a beautiful view of the Thames and the opposite coast of Essex.' In 1846 the 150 acres of Combe Farm were leased to the Roberts family who were market gardeners on a grand scale, selling their varied produce to the London markets of Covent Garden and Spitalfields (Reilly 1989). By 1905, the ancient farm had disappeared, having been sold to developers (Ludlow 1992).

The railway first came to Charlton with the North Kent Line to London in 1849, served by Charlton station. In 1876 Westcombe Park station was opened to serve the people colonizing the new housing developments in that part of Charlton. Nevertheless, in the foreword to West (1906), the distinguished lepidopterist J. W. Tutt (1858–1911) was able to write that, still in 1878, 'Charlton was an isolated village . . . and the country around was still country in the best sense. Westcombe Park was unopened, and only a single pathway led through it. The old West Combe House was still the solitary building therein, and Westcombe Hill contained a dairy farm and six houses, whilst its hawthorn hedges and mighty elm trees were the glory of the district.'

In this article I have followed for mammals the nomenclature used by Corbet and Harris (1991); for birds the *London Bird Report* for 2010; for macrolepidoptera Asher et al. (2001) (butterflies), and Waring and Townsend (2003) (moths); for microlepidoptera Sterling and Parsons (2012), and for plants Burton (1983).

The pre-1900 flora of Charlton

Before Charlton began to be engulfed by the outwards spread of urban and industrial development from London from about 1880, its attractive rural countryside often attracted naturalists in previous centuries, who found their visits well rewarded. The botanists (Edgington 2011; Grinling et al. 1909) and entomologists, in particular, found much to interest them, especially in the chalk- and sand-pits, of which particulars will be more conveniently given later under the heading Gilbert's Pit SSSI and the other chalk- and sand-pits. Elsewhere in rural Charlton these early naturalists reported finding such plants (earliest record in parentheses) in the Thames-side marshes as common meadow-rue *Thalictrum flavum* (1597), whorled water-milfoil *Myriophyllum verticillatum* (1836), lesser marshwort *Apium inundatum* (1836), yellow loosestrife *Lysimachia vulgaris* (1836), fen bedstraw *Galium uliginosum* (1836), marsh sow-thistle *Sonchus palustris* (1666), marsh arrowgrass *Triglochin palustris* (1836), lesser pondweed *Potamogeton pusillus* (1650), crow garlic *Allium vineale* (1813), summer snowflake *Leucojum aestivum* (*c.*1778), fat duckweed *Lemna gibba* (1890s), field brome *Bromus arvensis* (1890s) and green bristle-grass *Setaria viridis* (1890s).

In Hanging Wood (also called Charlton Wood in the past and now incorporated into Maryon and Maryon-Wilson Parks) old records include wood horsetail *Equisetum sylvaticum* (1666), *male fern *Dryopteris filix-mas*

FIGURE 3. Hanging Wood Lane, Charlton, early 1900s, from an old postcard.

FIGURE 4. Maryon Park, Charlton, *c.*1900, with the eastern slopes of Gilbert's Pit (Charlton Sandpit) and the Romano-British camp in the background, from an old postcard.

FIGURE 5. Wooded dell below St Luke's Church, Charlton village, now the site of the Springfield Grove housing development, from an old postcard.

FIGURE 6. View north-westwards over part of the Charlton quarries, *c.*1870. Photo courtesy of the Greenwich Heritage Centre.

(1898), narrow buckler fern *D. carthusiana* (1898), hairy violet *Viola hirta* (1666), pale St John's-wort *Hypericum montanum* (1746), Deptford pink *Dianthus armeria* (1762). *three-veined sandwort *Moehringia trinervia* (1763), alder buckthorn *Frangula alnus* (1793), harsh downy rose *Rosa tormentosa* (1763), opposite-leaved golden-saxifrage *Chrysosplenium oppositifolium* (1633), alternate-leaved golden-saxifrage *C. alternifolium* (1746), creeping Jenny *Lysimachia nummularia* (1793), wood forget-me-not *Myosotis sylvatica* (1666), dark mullein *Verbascum nigrum* (1763), moth mullein *V. blattaria* (1842), twiggy mullein *V. virgatum* (1842), wood speedwell *Veronica montana* (1774), greater broomrape *Orobanche rapum-genistae* (1787), *bugle *Ajuga reptans* (1597), crosswort *Galium cruciata (Cruciata laevipes)* (1597), woodruff *Galium odoratum* (1763), fen bedstraw *G. uliginosum* (1793), hairy wood-rush *Luzula pilosa* (1762), wild daffodil *Narcissus pseudonarcissus* (1724), birds's-nest orchid *Neottia nidus-avis* (1762), lesser butterfly orchid *Platanthera bifolia* (1763), stinking iris *Iris foetidissima* (1763), wood club-rush *Scirpus sylvaticus* (1800), starved wood sedge *Carex depauperata* (described from a plant found here in 1787 when there was a large population (Burton 1983)), plicate sweet-grass *Glyceria plicata* (*c.*1890s), giant fescue *Festuca gigantea* (1793), *tufted hair-grass *Aira caespitosa* (1793), *wavy hair-grass *A. flexuosa* (1793), silver hair-grass *A. caryophyllea* (1793), *velvet bent-grass *Agrostis canina* (1793) and marsh foxtail *Alopecurus geniculatus* (1793).

In other locations in the then Charlton countryside of orchards, meadows, arable fields and cornfields, the early botanists reported the presence of blinks *Montia fontana* (late eighteenth century), oak-leaved goosefoot *Chenopodium glaucum* (1842), common fumitory *Fumaria officinalis* (in 'a corne fielde' 1597), *fine-leaved fumitory *F. parviflora* (1597), round-leaved crane's-bill *Geranium rotundifolium* (*c.*1890s), heath cudweed *Gnaphalium sylvaticum* (1836), *chicory *Cichorium intybus* (nineteenth century), *beaked hawksbeard *Crepis vesicaria* (1713), yellow star-of-Bethlehem *Gagea lutea* (West Combe 1836) and common star-of-Bethlehem *Ornithogalum umbellatum* (1836). On Woolwich Common they recorded lesser reedmace *Typha latifolia* (1787), hairy sedge *Carex hirta* (*c.*1890s) and narrow buckler fern *Dryopteris carthusiana* (*c.*1700).

*According to Burton (1983), and my own notes, those species listed above with an asterisk were still to be found in the Charlton district up to the 1980s.

The wildlife of post-1900 Charlton

Old Charlton

When I was twelve years old in 1943, my family moved to a house in Eversley Road in a post-1880s development a little to the north of the Charlton Road, and quite close to Blackheath Rugby Club's Rectory Field ground, I was initially quite depressed by our immediate urban surroundings. Between 1937 and that date we had lived on the Kentish outskirts of south-east London and I had become used to roaming in the adjacent mainly open and pleasant countryside. Fortunately, I soon found that the attractions and wildlife of nearby Blackheath and Greenwich Park, the Shooters Hill woods and the more distant but easily reached woods to the east of Plumstead were not inconsiderable compensation. When the Second World War was over, and air raids were a thing of the past, I was able to travel more freely and able to cycle out to my old haunts in the Chislehurst district of north-west Kent and beyond.

Our house and garden were typical of the small Edwardian terraced houses in this part of Charlton. The tiny front garden was screened from the road, like most of the others in the street, by hedges of cultivated privet *Ligustrum* sp. The back garden consisted of a small lawn surrounded on four sides by narrow flower beds. The smoke-polluted soil looked tired and lifeless and it was difficult to imagine that some seventy or so years earlier it had been part of a flowery meadow with scattered trees. With the prevailing westerly winds blowing the smoke from the coal-burning houses and factories of London over the eastern London suburbs since the early nineteenth century this was to be expected. There were mature trees here and there in other gardens in our street and those of the parallel street, Sandtoft Road, whose gardens backed on to ours. There were two such trees, sycamores *Acer pseudoplatanus* in the garden immediately behind ours. I believe they were at least a hundred years old in the 1940s; so they must have survived from those growing in the original meadow, probably planted to provide shade and shelter for livestock.

In the sixteen years (1943–1959) when we lived in Eversley Road I recorded thirty species of birds that alighted in the garden or on the house (15) or flew over (15). Those that alighted were feral rock dove *Columba livia,* woodpigeon *C. palumbus,* carrion crow *Corvus corone,* blue tit *Cyanistes caeruleus,* great tit *Parus major,* wren *Troglodytes troglodytes,* starling *Sturnus vulgaris,* blackbird *Turdus merula,* song thrush *T. philomelos,* robin *Erithacus rubecula,* house sparrow *Passer domesticus,* pied wagtail *Motacilla alba,* chaffinch *Fringilla coelebs,* greenfinch *Carduelis chloris* and goldfinch *C. carduelis;* those that merely flew over were mallard *Anas platyrhynchos,* kestrel *Falco tinnunculus,* lapwing *Vanellus vanellus,* whimbrel *Numenius phaeopus,* black-headed gull *Larus ridibundus,* common gull *L. canus,* lesser black-backed gull *L. fuscus,* herring gull *L. argentatus,* tawny owl *Strix aluco* (single birds on 9 June 1949 and 1 February 1959), swift *Apus apus,* skylark *Alauda arvensis,* swallow *Hirundo rustica,* house martin *Delichon urbicum,* redwing *Turdus iliacus* and grey wagtail *Motacilla cinerea* (three together, 6 November 1949). Mammals seen in the garden and neighbouring roads included the inevitable house mice *Mus domesticus* and brown rats *Rattus norvegicus,* and, more surprisingly in these enclosed gardens, the occasional hedgehog *Erinaceus europaeus;* but I once watched one climb over a five-foot brick wall at the end of the street.

The Lepidoptera I recorded during the 1940s and 1950s in the house and garden were remarkably interesting. As well as the expected pierid and nymphalid butterflies, such as the green-veined white *Pieris napi,* small white *P. rapae,* large white *P. brassicae,* red admiral *Vanessa atalanta,* painted lady *V. cardui,* small tortoiseshell *Aglais urticae* and peacock *Inachis io,* I frequently observed, too, Essex skippers *Thymelicus lineola,* especially in the hot summer of 1947 (Burton 1979), holly blues *Celastrina argiolus,* and, occasionally, large skippers *Ochlodes venata* and meadow browns *Maniola jurtina.*

As for moths, I saw privet hawkmoths *Sphinx ligustri* in the garden at dusk and regularly found the larvae on our front garden privet hedge and those of our neighbours. Brindled beauty moths *Lycia hirtaria* were a frequent sight in spring on the trunks of hawthorn *Crataegus monogyna* trees growing in Eversley Road. I once saw a hummingbird hawkmoth *Macroglossum stellatarum* in our garden, on 1 November 1947, and my father saw another on 2 July 1950, while the immigrant silver Y *Autographa gamma* was a common visitor. I also recorded such other moths in the garden as the small magpie *Anania hortulata,* vapourer *Orgyia antiqua,* iron prominent *Notodontia dromedarius,* garden carpet

Xanthorhoe fluctuata, brimstone *Opisthograptis luteolata*, swallow-tailed moth *Ourapteryx sambucaria*, brindled beauty, scarce umber *Erannis aurantiaria*, muslin *Diaphora mendica*, buff ermine *Spilosoma lutea*, white ermine *S. lubricipeda*, garden tiger *Arctia caja*, heart and dart *Agrotis exclamationis*, shuttle-shaped dart *A. puta*, large yellow underwing *Noctua pronuba*, dot moth *Melanchra persicariae*, small angle shades *Euplexia lucipara* (also recorded at Charlton by Albin (1720)), gothic *Naenia typica*, old lady *Mormo maura*, mouse *Amphipyra tragopoginis*, bird's wing *Dypterygia scabriuscula*, setaceous Hebrew character *Amathes c-nigrum*, and buttoned snout *Hypena rostralis* (8 June 1947). Other insects I recorded here included the lesser stag beetle *Dorcus parellelipipedus* (22 June 1959) and the hornet hover-fly *Volucella zonaria* (4 September 1951).

Situated near our house and garden, at the junction of Bramshott Avenue and Invicta Road, above the tunnel carrying the railway line to Blackheath and Lewisham, was a hillock of rough grassland. This held a large colony of the field grasshopper *Chorthippus brunneus* (Thunberg) up to at least 1959, some of them of the black or blackish forms that were common on the polluted soils of south-east London.

Near the junction of Charlton Road and Wyndcliff Road, a few pairs of house martins nested during the 1940s under the eaves of a row of shops on the south side of Charlton Road, close to Blackheath Rugby Club's Rectory Field ground. Immediately to the east of the latter there was once a pleasant area with scattered trees known as Cherry Orchard (Figure 2), where in 1944 to 1946 I used to see green woodpeckers among the more usual species of birds. There was presumably a cherry orchard there at one time, but in 1946 Greenwich Borough Council began building the Cherry Orchard Estate, consisting of typical postwar-era blocks of flats and houses set among lawns and the surviving trees. This was followed by the adjacent Springfield Grove development of nine blocks of flats, up to eight storeys high, built around the sides of a steeply sloping wooded dell just west of St Luke's Church and Charlton village (Figure 5), with views towards the Thames (Greenwich Borough Council 1951). With their construction another portion of formerly rural Charlton and its former wildlife inhabitants disappeared.

Charlton Marsh (New Charlton)

The name New Charlton was applied in the late nineteenth century to the conglomeration of industry and housing that developed from Victorian times on Charlton Marsh, the flat alluvial area bordering the south bank of the Thames, an eastward extension of Greenwich Marshes. Originally brackish salt-marsh, the Romans, working outwards from London, are usually credited with the first attempts to reclaim it from the tidal Thames. This work apparently continued slowly on a small scale until Edward II's reign from 1307 to 1327, when reclamation began in earnest with the appointment of seven Royal Commissions during that period. In 1314 orders were given for the repair of seawalls and dykes from Greenwich to Dartford 'Flete'. By 1625, the marshes along this stretch of the Thames were well drained (Bartlett 1964–5; Mills 1999) and consisted of fields intersected by drainage ditches and were mostly given over to pasture, but with some market gardens. The importance of the latter to the daily food requirements of London led to their steady growth so that, as mentioned earlier, by the ninteenth century they were a conspicuous feature of Charlton and Greenwich Marshes, and some of them survived up to

the end of the First World War as allotment gardens; a few even survived up to the end of the Second World War.

Like the adjacent Greenwich Marshes, Charlton Marsh was much visited by the well-known and distinguished entomologist, J. W. Tutt, who resided at Rayleigh Villa on Westcombe Hill on the boundary of Charlton and Blackheath. He and his contemporaries found these localities rich in Lepidoptera. Tutt (in West 1906) stated that up to 1878 they could see in a single evening hundreds of moths. These included such typical species of fen and marsh as the puss moth *Cerura venula,* eyed hawkmoth *Smerinthus ocellata,* elephant hawkmoth *Deilephila elpenor,* southern wainscot *Mythimna straminea,* smoky wainscot *M. impura,* fen wainscot *Arenostola phragmitidis,* large wainscot *Rhizedra lutosa,* the crescent *Celaena leucostigma,* middle-barred minor *Oligia fasciuncula,* crescent striped *Apamea oblonga,* large nutmeg *A. anceps,* dingy shears *Parastichtis ypsillon,* clouded border *Lomaspilis marginata,* plain pug *Eupithecia simpliciata* and cream-bordered green pea *Earias clorana.* The species typical of the formerly extensive market gardens included the Chinese character *Cilix glaucata,* knot grass *Acronicta rumicis,* frosted orange *Gortyna flavago,* rosy rustic *Hydraecia micacea,* the flame *Axylia putris,* marbled minor *Oligia strigilis,* cloaked minor *Mesoligia furuncula,* the uncertain *Hoplodrina alsines,* white-line dart *Euxoa tritici,* garden dart *E. nigricans,* dot moth, dark sword-grass *Agrotis ipsilon,* shuttle-shaped dart, deep-brown dart *Aporophyla lutulenta,* the nutmeg *Discestra trifolii,* bordered beauty *Epione repandaria,* willow beauty *Peribatodes rhomboidaria,* dwarf cream wave *Idaea fuscovenosa* and dark spinach *Pelurga comitata.*

Between 2002 and 2004 lepidopterist Tony Day light-trapped moths at the recently created Greenwich Peninsula Ecology Park bordering the Thames in the Greenwich Marshes, adjacent to Charlton Marsh, and recorded fifty-five species of macro moths (Freed 2012). These, included six of the species characteristic of fen and marsh recorded by Tutt in the late nineteenth century: clouded border, cream-bordered green pea (nowadays nationally scarce and very local and rare in the London area), puss moth, elephant hawkmoth, fen wainscot and large wainscot, plus the sallow *Xanthia icteritia.* Freed's own survey in 2009 (Freed 2012) recorded four of these seven species together with an additional four species to those recorded by Tutt: southern wainscot, smoky wainscot, dingy shears and the crescent. In addition to these fen and marsh species, Freed recorded obscure wainscot *Mythimna obsoleta,* shoulder-striped wainscot *M. comma,* bulrush wainscot *Nonagria typhae,* twin-spotted wainscot *Archanara geminipuncta,* and Webb's wainscot *A. sparganii* and dotted fan-foot *Macrochilo cribrumalis* (both extremely local and rare species in the London area). Freed also recorded micromoths and of these found two common species of fen and watery habitats, the ringed china-mark *Parapoynx stratiotata* and the small china-mark *Cataclysta lemnata* (Pyralidae), and two rare species, *Caloptilia falconipennella* (Gracillaridae) and *Gynnidomorpha alismana* (Tortricidae) (Freed 2012), extremely rare in Kent.

Until about 1880 the Greenwich and Charlton Marshes, nestling in a loop of the River Thames (it makes sense to treat them together, although the former are not strictly within the area with which I am concerned here), were just as good a resort for the ornithologist and wildfowler as for the moth collector. Substantial areas had not yet been fully reclaimed from the pools, swamps and reed-beds which had dominated the landward side of the tidal shores from times long before the Romans began extending their first protective river-walls

eastwards from Londinium. Here wild duck, lapwings and common snipe *Gallinago gallinago* nested around the pools and in the swamps, while marsh and Montagu's harriers *Circus aeruginosus* and *C. pygargus,* spotted crakes *Porzana porzana* and water rails *Rallus aquaticus* built their nests low down in the osiers and reed-beds among the throngs of bearded tits *Panurus biarmicus,* reed buntings *Emberiza schoeniculus,* Savi's warblers *Locustella luscinioides,* reed warblers *Acrocephalus scirpaceus* and sedge warblers *A. schoenobaenus.* Bitterns *Botaurus stellaris,* too, probably uttered their far-carrying booming cries from the more-extensive of the reed-beds, as they certainly did up to the middle of the nineteenth century on Plumstead Marshes, a few miles farther east. In the 1810s the ornithologist G. Graves encountered most of these species near the Thames as close to central London as the marshy meadows, osier beds and reedy swamps then existing along the Old Kent Road and the Grand Surrey Canal between Bermondsey and Deptford (Fitter 1945).

Little had changed on these marshes in the 1850s: hen harriers *Circus cyaneus* were still to be seen frequently in winter and on migration in spring and autumn, just as they had been by Graves near the Old Kent Road; common snipe were still nesting and in winter they were joined by jack snipe *Lymnocryptes minimus.* By then, however, the River Thames above Woolwich was becoming increasingly polluted (1858 was 'the Year of the Great Stink'). This was initially caused by raw domestic sewage, and later, when that problem was temporarily solved in the early 1860s, by the addition of industrial waste and sewage from the growing number of factories springing up along the banks of the river (Harrison and Grant 1976). Nevertheless, small flocks of redshanks *Tringa totanus* and dunlin *Calidris alpina,* with the occasional curlew sandpiper *C. ferruginea,* could still be seen outside the breeding season feeding along the narrow mudflats of Blackwall, Bugsby's and Woolwich Reaches. It was the escalation from the 1870s onwards of chemical pollution produced by industry, added to the again growing quantities of sewage, that eventually reduced their visits to, at the most, a mere trickle. Only the scavenging gulls, mostly black-headed, but with annually increasing hordes of common, herring and lesser black-backed gulls, found things very much to their liking. They gained from the edible pickings to be gleaned amongst the glut of sewage discharged from the sewer outfalls and also from the vast amount of refuse tipped here and there along the river banks.

When, in the 1940s and 1950s, I used to walk along those parts of the river bank at Bugsby's and Woolwich Reaches which were accessible among the noisy factories, cranes and wharves covering much of the marshes from Greenwich to Woolwich, I found it a rather depressing experience. The river was then at its most polluted; the filthy, blackish and oxygenless water not only looked revolting, it smelt revolting, too. The rotten eggs odour of hydrogen sulphide pervaded everywhere, especially on hot, windless days in summer. Fish had long gone, apart from eels *Anguilla anguilla* which were able to come to the surface to breath the air. Only a few mute swans *Cygnus olor* and mallard, and the numerous gulls remained. The last, ever increasing, particularly in winter, thronged the foreshore and the barges moored in the water. When the sports grounds were occasionally flooded they attracted large gatherings of gulls. For example, on 16 March 1947 I saw about a thousand on Stone's Sports Ground at New Charlton, most of which were black-headed and common gulls, plus some herring gulls.

It was only marginally more enjoyable to explore those open spaces not yet actually submerged under bricks and mortar. They consisted, for the most part, of weed-covered spoil heaps, wasteland and disused, former refuse-tips but were quite rewarding for the naturalist. In the spring and summer of 1949 I investigated as thoroughly as I could all the areas to which I could gain access, including (having obtained written permission) the then South Eastern Gas Board's Coalite Works on Greenwich Marsh, the site now occupied by the Millennium Dome. Here, a male black redstart *Phoenicurus ochruros* had taken up residence, singing from the tops of the Coalite buildings and other structures. It apparently failed to attract a mate that summer, but this species has appeared there in subsequent breeding seasons into the 1970s at least, and may have succeeding in nesting on some occasions.

On 1 May 1949, to my surprise, I found a pair of wheatears *Oenanthe oenanthe* on the spoil heaps, which, overgrown with ruderal plants, provided a suitable breeding habitat for them. Those very few pairs which had bred in the London area in the recent past had selected just such wasteland sites. I failed to find this pair on my subsequent visits, but wheatears were regular passage migrants in small numbers in spring and autumn. Almost as pleasing was the discovery of at least three pairs of yellow wagtails *Motacilla flava flavissima* nesting on the spoil heaps. In the 1940s and 1950s, the yellow wagtail bred quite commonly all along the Thames-side 'wastelands' from Greenwich to Woolwich, and beyond, including two or three pairs on Charlton Marsh (Burton 1972). Since then it has almost vanished as a breeding species on the Kentish side west of Gravesend. But it might return if these river marshes were restored to something like their original state.

The wild plants which had colonized the spoil heaps and rough 'waste' ground around the industrial sites included the butterfly bush *Buddleia davidii*, evening primroses *Oenothera* spp., rose-bay willowherb *Chamaenerion angustifolium*, common mallow *Malva sylvestris*, Oxford ragwort *Senecio squalidus*, wall rocket *Diplotaxis tenuifolia*, wild mignonette *Reseda lutea*, common (ribbed) and tall melilots *Melilotus officinalis* (*arvensis*) and *M. altissima*, various clovers *Trifolium* spp., common yellow toadflax *Linaria vulgaris*, cow parsley *Anthriscus sylvestris*, wild parsnip *Pastinaca sativa*, coltsfoot *Tussilago farfara*, goat's-beard *Tragopogon pratensis*, elder *Sambucus nigra*, young birches *Betula* spp., and large quantities of bladder campion *Silene vulgaris*.

In between the spoil heaps, factories, warehouses, industrial wasteland and a sports ground, the remnants of the old grazing marshes and swamps consisted in 1949 of about two acres of reed-beds (on Greenwich Marshes) and reed-choked drainage ditches, old boundary hedgerows of hawthorn and some dog-rose *Rosa canina*, plus former meadows converted in the First World War to allotments, but still intersected by stagnant ditches. The reed-beds held a couple of pairs of reed buntings, a species I had not expected to find still breeding there, although they did so in small numbers on nearby Plumstead Marshes. Another minor surprise was the presence of a meadow pipit *Anthus pratensis* song-flighting over the allotments, another species which one had to travel to Plumstead Marshes to find the nearest other breeding pairs.

Skylarks were present in extraordinary profusion, many pairs nesting on the ground amongst the thick plant cover on the spoil heaps and industrial wasteland. Other breeding species I found included a few pairs of pied wagtails, goldfinches and linnets *Carduelis cannabina* (these last two attracted by the summer abundance of thistledown and other seeds), blackbirds and a

pair of common whitethroats *Sylvia communis*. Outside the breeding season, flocks of sixty or more linnets were often to be seen in the weedy areas. On a tall factory building a pair of kestrels usually nested; I sometimes watched them gliding around this and other buildings and snatching house sparrows from the window ledges.

The great wealth of wild flowers on the wasteland continued to attract a rich variety of insects right up to the 1970s at least. When, for example, I visited Greenwich Marshes on 28 July 1971 the blossoms of the thistles, hogweed *Heracleum sphondylium*, wild parsnip, wall rocket, Oxford ragwort and buddleia were swarming with various species of hoverflies, two species of bumblebees, honeybees *Apis mellifera*, and several species of butterflies: large skipper, Essex skipper, common blue *Polyommatus icarus*, small tortoiseshell, comma *Polygonia c-album*, meadow brown, and green-veined, small and large whites. Of particular interest for me was a six-spot burnet *Zygaena filipendulae*, nectaring at creeping thistle *Cirsium arvense* flowers, as I had never seen this moth on these marshes before, although I used to find it in abundance on the golf course at Shooter's Hill, a few miles away. Nearby I found a large patch of its larval foodplant bird's-foot trefoil *Lotus corniculatus*. In the wetter places I also found some relict plants of the ancient marsh in the form of great water-dock *Rumex hydrolapathum*, great willowherb *Epilobium hirsutum* and sea couch-grass *Agropyron pungens*, but was sorry to note that some of the remaining reed-marsh had been destroyed by the tipping of rubbish and rubble.

When staff members of the London Ecology Unit surveyed Greenwich Marshes in the mid 1980s (Swales et al. 1989). they still found much of wildlife interest there, including an area of willow *Salix* spp. scrub, a surviving reed-bed of quite large extent (one of only two they located in the whole Borough of Greenwich) and, adjacent to it, a ditch containing much great willowherb, yellow iris *Iris pseudacorus* and fennel-leaved pondweed *Potamogeton pectinatus* where it merges into a reedy swamp. They did not mention whether or not reed buntings continued to linger there, but reported that the area containing the reed bed, willow scrub and the tall hawthorn hedge, which separates this site from a sports field, was alive with birds.

By the late 1940s the Port of London Authority had been unable to tolerate any longer the appalling pollution of the Thames. During the following decade they began the great clean-up operation so well described by Harrison and Grant (1976). By 1963 the improvement in water quality, shown particularly by the increasing levels of dissolved oxygen, was already considerable. Fish and waterfowl quickly reacted by beginning to return to the inner reaches of the river. Herds of mute swans of previously unparalleled size built-up on the river around Greenwich Marshes, and were joined by larger numbers of mallard than had ever before been recorded this century. From the early 1970s they were being accompanied in winter by increasing numbers of other wild ducks, such as shelduck *Tadorna tadorna*, teal *Anas crecca*, pochard *Aythya ferina* and tufted duck *A. fuligula*. Even pintail *Anas acuta* and the occasional scaup *Aythya marila* or other rare species of duck have appeared. They also benefitted from the reduced disturbance as a result of the decline in the numbers of large ships using the river.

Despite the construction of the Thames Flood Barrier (Barrage) in Woolwich Reach between New Charlton and Silvertown in the late 1970s, large numbers of shelduck and teal continue to appear here in winter, plus the occasional garganey *Anas querquedula*, common scoters *Melanitta nigra*, red-breasted

mergansers *Mergus serrator,* etc. In addition to the usual gull species, the Caspian gull *Larus cachinnans* (recently recognized as distinct from the herring gull), yellow-legged gulls *L. michahellis* (up to six, for instance, by the Thames Barrier in October 2009), Mediterranean gulls *L. melanocephalus,* little gulls *Hydrocoloeus minutus,* kittiwakes *Rissa tridactyla* and a solitary, long-resident, ring-billed gull *Larus delawarensis* have been recorded. Black terns *Chlidonias niger* and Arctic *Sterna paradisaea,* common *S. hirundo* and Sandwich terns *S. sandvicensis* are also regularly seen on migration here and some common terns breed nowadays a little way downriver east of Woolwich at Crossness. A pair or two of oystercatchers *Haematopus ostralegus* (a very rare visitor in the 1940s) also breed at Crossness and, like the greenshank *Tringa nebularia,* redshank, dunlin and other waders are occasionally seen as far upriver as the Thames Barrier. Other birds associated with the river which have been seen here include Egyptian goose *Alopochen aegyptiaca,* cormorant *Phalocrocorax carbo,* shag *P. aristotelis,* little grebe *Tachybaptus ruficollis* and rock pipit *Anthus petrosus,* while on land by the Barrier at New Charlton such species as the peregrine falcon *Falco peregrinus,* turtle dove *Streptopelia turtur,* black redstart and linnet have been recorded.

Recently on the adjacent Greenwich peninsula (Marshes) an adult male red-backed shrike *Lanius collurio* was seen on 24 May 2008 and a wryneck *Jynx torquilla* on 18 September the same year. In 2009 a common redstart *Phoenicurus phoenicurus* was observed there on 5 September, and in 2010 one or two pairs of little grebe and a displaying meadow pipit were present during the breeding season. At other times that year, a single migrating pied flycatcher *Ficedula hypoleuca* was seen on 11 and 12 September, a sanderling *Calidris alba* was recorded on 3 December, single rock pipits were reported on 27 November and 7 December, on which latter date a flock of some eighty teal appeared (*London Bird Reports 2008–2010*).

As indicated in the previous paragraph, wading birds also returned and by the 1970s it was not unusual to see flocks of up to a thousand or more dunlin as far upriver as Thamesmead, together with parties or individuals of other species, feeding on the abundance of *Tubifex* worms and other organisms in the mud exposed at low tide. Paradoxically though, *Tubifex* worms thrive best in semi-polluted conditions and have declined in numbers as the river has become cleaner. This decline caused a temporary reduction in the numbers of wildfowl present during the 1980s until the populations of other inter-tidal estuarine organisms, such as ragworms *Nereis* spp., which prefer an unpolluted environment, had built-up sufficiently (Harrison and Grant 1976). On the whole, however, the numbers of wildfowl have been maintained since the 1970s or have even increased in the upper reaches of the Thames as the water quality of the river has continued to improve.

Gilbert's Pit SSSI and other chalk- and sand-pits

Just inland from Charlton Marsh, in the north-east corner of Charlton, there was an extensive and derelict area, once part of the Hanging Wood (mentioned in the Introduction), that had long (since the eighteenth century at least) been quarried for chalk and sand, leaving the former terrain deeply scarred (Figure 6). The chalk underlies the beds of Thanet Sand and gravels. These quarries attracted the interest of the early naturalists. From the chalk-pits the botanists recorded, in addition to the commoner species, climbing corydalis *Corydalis claviculata,* *wall rocket *Diplotaxis tenuifolia* (1836), *square-stalked willowherb

Epilobium tetragonum (1890s), spreading hedge-parsley *Torilis arvensis* (1836), alexanders *Smyrnium olusatrum* (1890s), blue fleabane *Erigeron acer* (1890s), *feverfew *Chrysanthemum parthenium* (1836), *tansy *C.* (*Tanacetum*) *vulgare* (1836), *welted thistle *Carduus crispus* (1890s), pyramidal orchid *Anacamptis pyramidalis* (1836), and bee orchid *Ophrys apifera* (four plants in 1894), and from the sand-pits, including Gilbert's Pit (formerly known as Charlton Sand-pit), *common (ribbed) melilot *Melilotus officinalis* (1907), kidney vetch *Anthyllis vulneraria* (1907), orpine *Sedum telephium* (1787), Alexanders *Smyrnium olusatrum* (1890s), common centaury *Centaurium erythraea* (1890s), common broomrape *Orobanche minor* (1805), lesser calamint *Clinopodium nepeta* (1777), heath groundsel *Senecio sylvaticus* (1903), *prickly lettuce *Lactuca serriola* (1805) and autumn lady's-tresses *Spiranthes spiralis* (1836).

As previously, those species that were still to be found in the Charlton district up to 1980 according to Burton (1983), and my own records, are indicated with an asterisk.

The lepidopterists recorded the common emerald *Hemithea aestivaria* (in 1844), the chalk carpet *Scotopteryx bipunctaria* (1844), pretty chalk carpet *Melanthia procellata* (1909) and six-belted clearwing *Bembecia ichneumoniformis* (1844) at Charlton Sand-pit (Gilbert's Pit) (Plant 1993) and at 'chalk pits by Charlton' the common heath *Ematurga atomaria* (Harris 1775). I found this last species to be plentiful in Gilbert's Pit in 1947. Another species reported by Moses Harris (1766) in *The Aurelian* was the scarlet tiger *Callimorpha dominula*. He wrote that: 'The best place to obtain the Caterpillar, is at Charlton in Kent, down in the Chalk Dell near the halfway house to Woolwich; and on beating the nettles which grow on the sides of banks, or other eminences, they will roll down in plenty.' The first Kent record of *dominula,* however, dates from 1748, when according to Dutfield (1748–1749) 'The Catterpillars [*sic*] . . . were found on the Hound's Tongue, the twentieth of April at Charlton in Kent.'

The six-belted clearwing was first reported from Charlton Sand-pit by Edward Newman, who stated that a great number had been taken by Messrs Douglas, Stevens, Ingall and Bedell by sweeping the herbage. T. Ingall reported on 17 July 1845 that 'many were taken during the past fortnight, including sixteen by Mr Shepherd in one afternoon. Another collector, H. J. Harding, stated that he took two dozen one afternoon. Not surprisingly, in 1851 it was reported that the species was 'much rarer now than formerly' (all above from Chalmers-Hunt 1960–1981). Other moths reported from elsewhere in Charlton by earlier generations of lepidopterists (e.g. C. Fenn, A. H. Jones, J. W. Tutt and W. West) included the gem *Orthonama obstipata* (at street lamps in 1865 and 1867), autumn green carpet *Chloroclysta miata* (*c.*1868), mottled grey *Colostygia multistrigaria* (1865), small waved umber *Horisme vitalbata* (1909), tawny-speckled pug *Eupithecia icterata* (1909), magpie moth *Abraxas grossulariata,* v-moth *Macaria wauaria* (1909), August thorn *Ennomos quercinaria* (1909), swallow-tailed moth, barred red *Hylaea fasciaria* (1861), waved umber *Menophra abruptaria*, bedstraw hawkmoth *Hyles gallii* (a larva in September 1859), poplar kitten *Furcula bifida* (1908), chocolate-tip *Clostera curtula,* ruby tiger *Phragmatobia fuliginosa* (1909), broom moth *Ceramica pisi* (Albin 1720), tawny pinion *Lithophane semibrunnea*, centre-barred sallow *Atethmia centrago,* plain golden Y *Autographa jota* (29 June 1864) and lesser belle *Colobochyla salicalis* (1809) (Grinling et al. 1909; Chalmers-Hunt 1960–1981).

The main chalk quarries were between Church Lane and Charlton Lane and were worked out by 1889 and soon became derelict. The area nearest Floyd Road was acquired soon after the end of the First World War, in 1919, by the Football League club Charlton Athletic F. C., for its new stadium 'The Valley'. It was known locally as Charlton Sand Pits and colloquially as 'The Swamp' or 'Swamps' because of a marshy area with small pools at its southern end. A natural bowl, it was dug into shape for a football arena by an army of volunteers, plus some hired labour, and was staging football matches before the end of 1919 (Figure 7). Large quantities of chalk were brought from the northern end and deposited over the marshy area and immensly high banks were built up on the eastern and southern sides of the ground (Redden 1990; Everitt 1991). The eastern side became the East Terrace, which could accommodate up to 50,000 spectators. Nowadays, the ground has been completely modernized as an all-seater stadium and the old East Terrace is no more. Whilst watching a game there on 23 August 1958 I observed between 15.30 and 17.00 hours a light migration of insects, mainly large numbers of small black Diptera, mostly Bibionidae (possibly the fever-fly *Dilophus febrilis*) and smaller numbers of hoverflies (Syrphidae), taking place south-south-eastwards across the stadium into a light south-south-west wind (Burton 1990).

The sand-pit to the north-east of the Romano-British camp, including the hillock called Cox's Mount, became Maryon Park in 1890–1891. The sand-pit below the camp to the south-west, which was excavated between the late nineteenth century and the First World War, had formed the north-western part of the Hanging Wood in the Maryon-Wilson estate. What remained of the Romano-British camp was purchased by the London County Council in 1930 and after the Second World War was designated a geological Site of Special Scientific Interest on account of its exposure of one of the most complete sequences of Lower Tertiary sediments in the London area, dating from about 55 million years ago. It is rich in marine fossil-bearing beds above the thick (*c.*40 feet / *c.*12 metres) deposit of Thanet Sand overlying the Chalk. As a schoolboy I was fascinated by the fossil shells and made a small collection (e.g. *Cyrena* spp., *Ostrea* spp., *Potamides* spp.). This site and the old excavations below the camp became known to me as Charlton Sand-pit (Figure 8) and appears thus in my journals, but is now officially called Gilbert's Pit, after a former site manager. The steep north-north-west-facing slopes of the heights on which the remains of the Romano-British camp is situated was known to the local people in the 1940s as Cox's Mount, but I see from the 1914 map (Ludlow 1992) that this name is reserved for the fenced-in hillock in the northern part of Maryon Park, which my friends and I called Plum Pudding Hill. I only once climbed it, on 25 May 1946, when I saw there common blue and small heath *Coenonympha pamphilus* butterflies, and a small phoenix moth *Ecliptopera silaceata* and a Mother Shipton moth *Callistege mi.*

From spring through to autumn, the bottom of Gilbert's Pit was thickly vegetated with a succession of wild and some alien plants: coltsfoot, wall rocket, Oxford ragwort, common ragwort *Senecio jacobaea*, mugwort *Artemisia vulgaris*, bird's-foot trefoil, broad-leaved willowherb *Epilobium montanum*, rosebay willowherb, hollyhocks *Alcea* sp., perforate St John's wort *Hypericum perforatum*, sun spurge *Euphorbia amygdaloides*, enchanter's nightshade *Circaea luteana*, butterfly bush *Buddleia davidii*, etc., which attracted a good range of Lepidoptera and other insects. These included such

FIGURE 7. The Valley, Charlton Athletic's football ground in the 1920s, with the Romano-British camp above Gilbert's Pit (Charlton Sandpit) in the background. Courtesy of the late Colin Cameron.

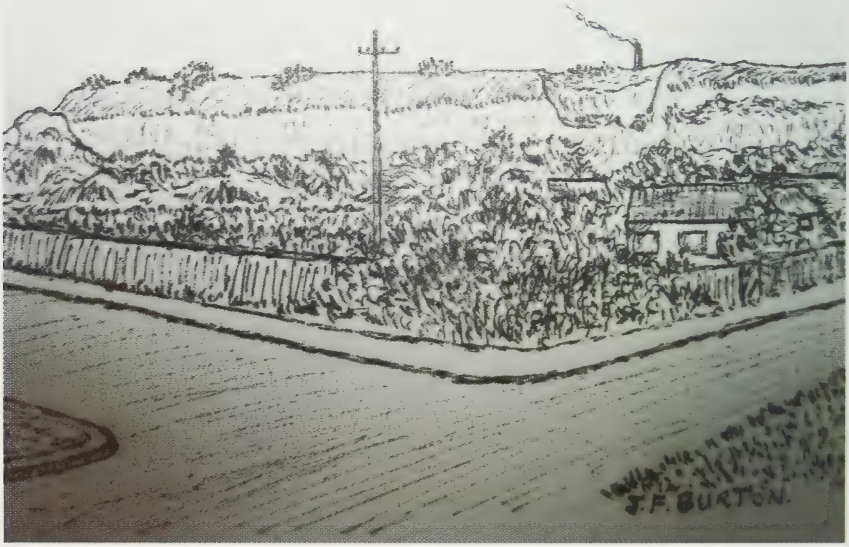

FIGURE 8. Gilbert's Pit (Charlton Sandpit) and the Romano-British camp, sketched by the author in 1947, from Hanging Wood Lane.

FIGURE 9. Thanet Sand in north-facing cliff at Gilbert's Pit (Charlton Sandpit), showing nesting holes of sand martins, 22 May 1947. *Photo: J. F. Burton*

FIGURE 10. Ancient black mulberry *Morus nigra* tree, planted in 1608, beside the seventeenth-century summerhouse of Charlton House, 6 April 2010. *Photo: J. F. Burton*

butterflies as the Essex skipper (Burton 1979), small skipper *Thymelicus sylvestris,* large skipper, green-veined white, painted lady, small tortoiseshell, peacock, comma, small copper *Lycaena phlaeas,* common blue, wall brown *Lasiommata megera* (recorded from here by Beddell as early as 1844 (Chalmers-Hunt 1960–1981)), meadow brown and small heath; and moths like the small magpie, leopard moth *Zeuzera pyrina*, narrow-bordered five-spot burnet *Zygaena lonicerae,* garden carpet, small phoenix, small waved umber (1946), the fern *Horisme tersata,* common heath, latticed heath *Chiasmia clathrata*, waved umber, willow beauty, poplar hawkmoth *Laothoe populi*, elephant hawkmoth (thirteen larvae on rosebay willowherb on 2 September 1946), humming-bird hawkmoth (two in July 1946), cinnabar *Tyria jacobaeae*, vapourer *Orgyia antiqua*, heart and dart, angle shades *Phologophora meticulosa,* Mother Shipton and silver Y. The willows at the top of the steep eastern slope of the Roman camp above Maryon Park produced larvae of puss moths, poplar hawkmoths and herald moths *Scoliopteryx libatrix,* and other species.

European gorse *Ulex europaeus* and broom *Cytisus scoparius* grow here, too. Kestrels, that bred somewhere in the neighbourhood, regularly hunted along its eastern cliffs and I spent many hours in the 1940s watching them hunting: their prey here included field voles *Microtus agrestis* and common shrews *Sorex araneus.* At the southern end of the pit there is a sheer north-facing cliff of almost white Thanet Sand, some forty feet (twelve metres) high (Figure 9). In the 1940s a colony of up to twenty-five pairs of sand martins *Riparia riparia* nested annually but were constantly harried by local childen, who tried to dig them out of their nesting burrows. Once in the 1970s I managed a brief visit to Gilbert's Pit but, as far as I could see from outside the secure fencing (in the 1940s there were several gaps in the fencing through which one could gain access), sand martins were no longer breeding there.

Among other species of birds breeding at Gilbert's Pit in the 1940s were jays, linnets, goldfinches, greenfinches, great spotted woodpeckers *Dendrocopos major,* wrens *Troglodytes troglodytes,* robins, blackbirds, song thrushes, willow warblers *Phylloscopus trochilus* and the occasional pair of yellow wagtails. Because of its prominent position, overlooking the Thames-side marshes, it attracted migrating birds. I frequently sat in spring and autumn on the cliff-top at the northern end of the Roman camp and watched migrating hirundines, meadow pipits, pied wagtails, yellow wagtails, linnets, goldfinches and chaffinches arriving, some dropping down to rest and others moving on. Wheatears, including the northern race, and the occasional tree pipit *Anthus trivialis* and grey wagtail were also to be seen on passage there.

A pair of tree pipits actually nested in the bottom of Gilbert's Pit in 1945 and a pair of yellow wagtails in 1946 (Burton 1972). From winter to early spring flocks of mistle thrushes *Turdus viscivorus,* fieldfares *T. pilaris* and redwings often appeared and stayed to feed on the berries of the many hawthorns that clothed the steep slopes above Maryon Park, and also on the shallower slopes on the west side of the sand-pit, above Pound Park Road, joining mixed feeding parties of blue, coal *Periparus ater,* great and marsh *Poecile palustris* tits. Large flocks of greenfinches, goldfinches and linnets gathered as well in the thick vegetation on the sand-pit bottom to feed on the abundant seeds. Grey herons *Ardea cinerea* occasionally flew over on their way to and from the Thames marshes.

Hanging Wood

As mentioned in the Introduction, a prominent natural feature of pre-twentieth-century Charlton, covering the hillside facing the Thames, was the so-called Hanging Wood. In that respect it resembled the well-known 'hangers' of north Hampshire, such as the famous one above Gilbert White's Selborne. Remnants survive today in Maryon Park and Maryon-Wilson Park, descriptions of which now follow.

Maryon Park

As mentioned earlier, this small park (Figure 4) was created in 1890 from part of the sand-pit known as Gilbert's Pit, which had once been a part of Hanging Wood (Clark 1990). As it was rather urban in character, I didn't often visit it, but nevertheless recorded such birds as woodpigeons, great spotted woodpeckers, wrens, dunnocks *Prunella modularis,* robins, blackbirds, song thrushes, chiffchaffs *Phylloscopus collybita,* willow warblers, blue tits, great tits, jays and chaffinches there. Butterflies I saw there on the buddleia and, in autumn, on the Michaelmas daisies were red admirals, painted ladies, small tortoisehells, commas and holly blues, and, on one occasion, 22 September, 1946, a male clouded yellow *Colias croceus.* This last species must also have occurred there and elsewhere in Charlton in 1947, as it was a 'clouded yellow year', and it was to be seen flying throughout south-east London in great profusion.

From the southern end of Maryon Park a steep series of steps leads up to Thorntree Road, formerly called Hanging Wood Lane (Figure 3) until the name was changed in the 1920s. This road passes, on the right, the southern end of Gilbert's Pit and descends a hill from which paths leading into Maryon-Wilson Park are reached on the left.

Maryon-Wilson Park

Until it was sold by the Maryon-Wilson family to the London County Council in 1925 and opened to the public, this park formed the central and southern parts of Hanging Wood. The varied terrain is lightly wooded for the most part, although there are some small areas of denser woodland. In the lower part of the central combe there is a small enclosure containing a few red deer *Cervus elaphus*: on 8 May 1959 I counted nine, including a single stag, there. A small farm with domestic animals has since been added to the deer enclosure. A small stream and its adjacent wet grassland still support such rare wild plants as bog stitchwort *Stellaria alsine* and bristle club-rush *Isolepis setacea* (Natural England 2012).

Hanging Wood formerly extended as far west as Church Lane, but this area between that lane and Charlton Lane was excavated for sand and chalk in the nineteenth century and nowadays includes the site of Charlton Athletic FC's stadium. Willow warblers were a feature of Maryon-Wilson Park in the 1940s and 1950s, and I often saw several swifts flying overhead in the summer months. As early as 1944 I saw green woodpeckers *Picus viridis* there. Other species I noted were woodpigeons, stock doves *Columba oenas,* great spotted woodpeckers, wrens, dunnocks, robins, blackbirds, song thrushes, chiffchaffs, blackcaps *Sylvia atricapilla,* long-tailed tits *Aegithalos caudatus,* blue tits, great tits, jays, starlings, greenfinches and chaffinches. I am sure I would have found the park more productive if I had visited it more often. All these species have

been seen here in recent years by such observers as John Tilbrook and Des McKenzie (*London Bird Reports*), plus lesser spotted woodpecker *Dendrocopos minor* (*London Bird Report 2008*), magpies *Pica pica* (two or three breeding pairs) and brambling *Fringilla montifringilla* (one on 12 December 2000).

A large tortoiseshell butterfly *Nypmphalis polychloros* was apparently seen in this park, by J. H. Hider in early June 1975, who also saw a brimstone butterfly *Gonepteryx rhamni* there in August 1976 (Chalmers-Hunt 1960–1981). A. A. Allen recorded a gatekeeper *Pyronia tithonus* in the park in August 1976. Up to the nineteenth century, the white admiral *Limenitis camilla* used to inhabit Maryon-Wilson Park when it was then part of Hanging Wood (Bree 1833).

Charlton House, Park and Cemetery

The grounds both in front of and behind the fine seventeenth-century manor house, Charlton House, former home of the Maryon-Wilson family, were and still are quite attractive to wildlife. In the 1940s and 1950s a few pairs of jackdaws nested annually in holes in some old elms that then existed in front of the house, but were not there in early April 2010 when I made my most recent visit; their place was taken by a couple of pairs of stock doves. The fine gardens (the three walled gardens, the Herbaceous Garden and the Wilderness) behind the house are home to the usual range of birds one would expect, including woodpigeons, blue tits, great tits, wrens, robins, blackbirds, mistle thrushes, starlings, greenfinches and chaffinches. I saw three jays and a pair of magpies there in April 2010, also a ring-necked parakeet *Psittacula krameri*. The last two species did not occur there in the 1940s and 1950s; in the latter decade the magpie was just spreading into the south-east London suburbs. In the 1940s I occasionally saw lesser spotted woodpeckers there and heard a little owl *Athene noctua* at dusk on 25 October 1947. In more-recent years other observers (*London Bird Reports)* have added breeding collared doves *Streptopelia decaocto.* Two grey squirrels *Sciurus carolinensis* were also present when I visited the park in April 2010. Adjacent to the seventeenth-century summerhouse (shamefully used for many years as a public toilet) is the black mulberry *Morus nigra* tree planted in 1608 on the orders of King James I in the mistaken belief that silkworms could be reared on it, not realizing that that required a white mulberry *Morus alba*. Nowadays, the collapsing, venerable old tree is protected and supported by iron railings (Figure 10).

Behind Charlton House, Charlton Park extends eastwards towards Charlton Cemetery, and, a little beyond to the south-east, Woolwich Common. It was carved from the northern half of what was once Charlton Common, lying on the west side of an old road which formerly separated it from Woolwich Common. It was a deer park up to the early 1920s when it had a fair number of trees, but nowadays it consists largely of sports pitches and tennis courts. Nevertheless, it was not devoid of birds and I saw pied wagtails, wrens, dunnocks, robins, blackbirds, song thrushes, blue tits, great tits, jays and jackdaws there.

I never visited Charlton Cemetery but Des (D. T.) McKenzie (pers. comm. 2008) recorded two goldcrests *Regulus regulus* singing there in 2000 and a firecrest *R. ignicapilla* on 12 December that year, and in 2001 a pair of jays and two pairs of apparently breeding coal tits (*London Bird Reports).*

The distinguished amateur entomologist, A. A. Allen, who lived at Blackheath Park and later, from the 1990s, close to Charlton Park, made many interesting entomological observations in the vicinity of the latter, including in

his garden in Montcalm Road (Allen 1991, 1992*a*, 1994*a*, *b*, 1997). He specialized in Coleoptera, Diptera and Lepidoptera and published details of many of his finds in such journals as the *Entomologist's Monthly Magazine* and the *Entomologist's Record.* In 1994, for instance, he reported the return of the speckled wood *Pararge aegeria* to the Charlton and Woolwich areas, from which they had disappeared by the end of the nineteenth century (Allen 1994*a*; Burton and Freed 2009). The gatekeeper had similarly vanished from these areas during the late nineteenth century and Allen (1991, 1992*a*) recorded its recolonization of Woolwich Common and, in 1996, Charlton (Allen 1997). Other butterflies he observed at Charlton included Essex skipper, large skipper, small copper, red admiral and wall brown (singletons in 1974, 1978 and 1979). Moths he recorded included ghost swift *Hepialus humuli,* carnation tortrix *Cacoecimorpha pronubana* (Allen 1992*b*), least carpet *Idaea rusticata (vulpinaria)* (a pair flying *in cop.* in his garden very early in the morning of 24 June 1976, and 'flying in clouds at first light' on 26 June 1976), Freyer's pug *Eupithecia intricata arceuthata (*June 1978), bordered pug *E. succenturiata,* light emerald *Campaea margaritata,* waved umber and plain golden Y (24 June 1976) (Chalmers-Hunt 1960–1981).

Woolwich Common

This open expanse of mainly rough grassland, rich in its variety of the common wild flowers, is partly surrounded by military establishments and lies on the boundary between the boroughs of Greenwich and Woolwich. I referred to it in a paper on the flora and fauna of Shooters Hill, which rises adjacent to it (Burton 1992) and in much more detail in a follow-up paper (Burton 2008*b*). It also lies on the eastern boundary of Charlton. As I have nothing to add to the information on the birds of Woolwich Common contained in the two papers just quoted, I will simply refer readers to them. The Common was and still is well worth visiting by naturalists. Incidentally, the paper on the birds of Charlton by Des McKenzie referred to as being in press in Burton (2008*b*) has yet to be completed (McKenzie pers. comm. 2012).

As for the Lepidoptera of Woolwich Common, I am summarizing here the limited data for the Common of which I am aware. As mentioned under Charlton Park, A. A. Allen (1991, 1992*a*, 1994*a*, 1997) reported the recolonization of Woolwich Common by the speckled wood and gatekeeper butterflies in the 1990s after an absence of a century or more. Other butterflies present on the Common include the Essex skipper (very numerous as recently as the early 1990s), small skipper (discovered in 1990), small copper, common blue (numerous), holly blue, wall brown (scarce), meadow brown (numerous), small heath (numerous at times). Moths include the six-spot burnet (usually numerous), latticed heath (numerous in 1947) and cinnabar (larvae numerous on common ragwort). Back in 1865, a heart moth *Dicycla oo* was collected from an oak on the Common (Burton 2008*b*).

Woolwich Royal Military Repository

Having been intrigued by the report in Grinling et al. (1909) of kingfisher being seen here and the existence of a rookery that had contained thirty nests in 1907, I resolved to try to arrange a visit to this enclosed park-like military property, which contains a sizeable lake. However, I was able to obtain permission to do this on only one occasion, 17 January 1959, a sunny but cold

morning. Unfortunately, the lake was completely frozen when I was privileged to be shown round by Major J. Phillipson of the Woolwich Garrison, and the only waterbird present was a single moorhen *Gallinula chloropus*. The other birds we saw during our walk were several woodpigeons, a great spotted woodpecker, a skylark flying over to the south, eight jays, a magpie, six carrion crows, two wrens, several blue tits, two great tits, a robin, a song thrush, seven redwings, several blackbirds and a male bullfinch. Major Phillipson informed me that the rookery had long ceased to exist, but did not know the date of its demise, nor was I able to find out in the course of further enquiries. Major Phillipson also told me that he had caught common carp *Cyprinus carpio*, common bream *Abramis brama*, rudd *Scardinius erythrophthalmus* and roach *Rutilus rutilus* in the lake.

Acknowledgements

I am most grateful to Desmond McKenzie for generously supplying an account of his ornithological observations on Woolwich Common; to Keith Hyatt for helpful advice; and to Laura Schmidt-Thomée for other help in compiling this article. My thanks are also due to two unnamed referees for constructive comments and suggestions for its improvement. I have made every effort to trace the copyright owners of the illustrations which are not mine and will gladly make future acknowledgement to them if contacted.

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Book review

Who found our ferns? A history of the discovery of Britain's ferns, clubmosses, quillworts and horsetails. John Edgington. British Pteridological Society, Special Publication No. 12. London. 2013. 216 pp. Softback, 245 × 170 mm. Over 160 illustrations. ISBN 978 0 9926120 1 6. £15, post free until April 2014 from Pat Acock, 13 Star Lane, St Mary Cray, Kent BR5 3LJ.

John Edgington is well known to LNHS members both as a past secretary of the Society and more recently as our president. He is also the current president of the British Pteridological Society. Very few of us, however, were aware that he was writing this book, but it came as no surprise to discover the excellence of its contents.

As David Pearman points out in his forward, the book breaks new ground in searching out and bringing together details of the first discoveries of all of Britain's native ferns and their close allies. Eighty-five taxa are covered, including two new species that have only recently come to light and are not included in the third (2010) edition of Stace.

In his introduction, the author discusses some of the many pitfalls encountered in researching the book. Two thirds of the species covered, for example, were first named before Linnaean binomials became the standard, and lengthy Latin 'phrase names' were often used to describe them. Many examples of such descriptive names are reproduced from contemporary literature and, most helpfully, these are accompanied by the author's own English translations. It is often difficult to interpret phrase names so as to be quite sure which species was being described. It was also often the case that many supposedly different species were in fact the same taxon as presently understood. Conversely, more than one species (as subsequent research has shown) were often subsumed under the same phrase name. Solutions to such problems could sometimes be found by examining contemporary drawings and paintings or, better still, herbarium specimens. The book contains many such illustrations, and all of these are of high quality.

The first chapter gives an historical account of those early botanists who most contributed to elucidating and describing the British fern flora, either through their published works or through their original discoveries.

The first to be discussed is William Turner (1508–1568) who was the earliest Englishman to study plants for their own sake and not just for their medicinal properties. He was the first to write about several common ferns, including 'hertes tonge' *Asplenium scolopendrium*, which he saw close to his home in Northumbria and described in 1538. Soon after, Mathias de l'Obel (1538–1616), a Fleming and another famous physician and botanist, settled in England and published a number of botanical works. Among many other discoveries, he was the first to describe the delicate wood horsetail *Equisetum sylvaticum*, which he saw on Highgate Hill near to where he lived. It still occurs close by at Ken Wood. The work of other notable pre-Linnaean botanists and their fern discoveries follows in chronological order, culminating with the great John Ray (1627–1705) who, in addition to his renowned publications, personally added another seven species to the list of British ferns and their allies, including lesser clubmoss *Selaginella selaginoides* which he saw on Cader Idris on 5 September 1658.

The bulk of the book presents a systematic and detailed account of the discovery and elucidation of all our native pteridophytes. There are sixteen chapters, each one covering a separate family. It is here that we discover the huge amount of bibliographic research undertaken by the author in order to untangle the often complex stories surrounding the early discovery of our ferns. The text includes many notes that direct the reader to the relevant primary sources listed in the extensive bibliography.

At the end of the book there are two useful appendices. The first lists all the fern species in alphabetical order of their Linnaean names and provides succinct extracts (taken from the detailed species accounts) of their earliest reporting, the names of their discoverers and the date and place where they were found. The second appendix, arranged alphabetically by their modern names, lists for each a selection of the phrases used to describe them. For some species as many as ten such are listed and more can often be found in the detailed species accounts. The book ends with a full index of plant names, which includes many early Linnaean, as well as phrase names and current binomials.

This is a marvellous book and a very enjoyable read. The author's erudition, careful exploration of the literature, and attention to detail, are apparent on every page. It is highly recommended.

DAVID BEVAN

The marine algae (seaweeds) of the tidal Thames: new records and observations

IAN TITTLEY

Department of Life Sciences, Natural History Museum, London SW7 5BD

Abstract

Recent fieldwork in the tidal Thames between Shoeburyness, Sheerness and Putney has revealed 16 species new to the estuary with 77 species now recorded, comprising 31 Rhodophyta, 13 Phaeophyceae (Ochrophyta), 1 Xanthophyceae (Ochrophyta) and 32 Chlorophyta. Twenty-five species have been shown to occur further upriver than previously reported. Sea and river walls along the Thames have created habitat for colonization by benthic marine algae and thus enhanced algal biodiversity. The softer natural banks of saltmarsh also provide habitat for algal colonization but by communities that differ from those on sea walls. The red alga *Bostrychia scorpioides*, a saltmarsh species that was considered to have become extinct in the estuary, has been found recently in south Essex, north Kent and Greater London to Thamesmead in the remaining pockets of primary natural saltmarsh and also in saltmarsh formed secondarily on or in front of sea walls. The red alga *Polysiphonia*, possibly *P. stricta* or *P. subtilissima*, was found at Bermondsey where very low salinities and periodical freshwater conditions prevail; this is the first record for Britain of *Polysiphonia* in near-freshwater conditions. The small green alga *Rosenvingiella radicans* was recorded for the first time in the Thames (and southeast England) at Woolwich.

Introduction

The benthic marine algal flora of the tidal Thames was poorly known until the 1970s although there are historical records for London, Rotherhithe, Charlton, Greenwich, Woolwich, Gravesend and Sheerness that can be traced back to the seventeenth century (Tittley 2005). Since the 1970s a series of studies has been undertaken that has improved knowledge of the occurrence and distribution of algae between Teddington and Sheerness and Southend (Tittley and Price 1977; Price 1982, 1983; Tittley and John 1998; Tittley and Cox 1999; Tittley 2001, 2009*a*). Distributional studies have analysed the patterns of species occurrence and classified the estuary into floristic sections and subsections according to the particular algal species present (Tittley and Price 1977; Tittley and John 1998) while ecological studies have described the algal zonation on sea and river walls relative to tide level (Tittley and Price 1977; Tittley 1985, 2001) and followed successional seasonal changes (Tittley 1985). In the inner reaches of the estuary the natural fringing marsh has been lost and replaced by man-made structures, particularly river and sea walls,

that now create the main surfaces and habitats for algal colonization. Where and how such structures are built and what they are made of plays an important role in maintaining, changing, and also enhancing local algal biodiversity (Tittley 2013).

The data for this paper were obtained in the course of recent field studies for a forthcoming revised atlas of the marine algae of Kent (Tittley, in prep.) that will also provide summary species maps for the southeast of England including the London area to the limit of the tidal Thames; to this end field studies have been undertaken at locations in London upriver to Putney. These studies have revealed algal species new to the estuary and other species further upriver than described in the review by Tittley (2009*a*) based on fifty-seven sites studied between Kew and Sheerness and Southend.

TABLE 1. Thames locations east (outer) to west (inner) referred to in the text.

Location	Monad	Location	Monad
West Kent Vice-County 16			
Sheerness	TQ9175	Gravesend, Rosherville	TQ6374
Grain, Hoo peninsula	TQ8977	Northfleet	TQ6274
Yantlet Creek, Hoo peninsula	TQ8579	Broadness east	TQ6176
Allhallows, Hoo peninsula	TQ8378	Broadness, Swanscombe Marshes	TQ6075
Allhallows west, Hoo peninsula	TQ8278	Greenhithe	TQ5975
West Point, Hoo peninsula	TQ7979	Littlebrook	TQ5776
St Mary's Bay, Hoo peninsula	TQ7978	Long Reach, Dartford Marshes	TQ5477
Egypt Bay, Hoo peninsula	TQ7779	Erith saltings	TQ5378
Blythe Sands, Hoo peninsula	TQ7679	Jenningtree Point, Belvedere	TQ5080
Lower Hope Point north, Hoo peninsula	TQ7279	Crossness, Thamesmead	TQ4781
Lower Hope Point, Hoo peninsula	TQ7178	Tripcock Ness, Thamesmead	TQ4581
Cliffe Fort	TQ7076	Woolwich Arsenal east	TQ4480
Higham Marshes	TQ7075	Woolwich, Bell Water Gate	TQ4379
Shornmead Fort	TQ6974	Woolwich west	TQ4179
Eastcourt Marshes	TQ6774	Greenwich peninsula east	TQ3979
Gravesend	TQ6574	Greenwich	TQ3878
Surrey Vice-County 17			
Bermondsey	TQ3479	Putney	TQ2475
Vauxhall	TQ3078	Kew	TQ1777
Battersea	TQ2977		
South Essex Vice-County 20			
Shoeburyness	TQ9484	Canvey	TQ8082
Southend	TQ8884	Purfleet	TQ5677
Leigh on Sea	TQ8385	Barking Point	TQ4681
Two Tree Island	TQ8384		
Middlesex Vice-County 21			
Wapping	TQ3580	Westminster	TQ3080
Blackfriars	TQ3180	Chelsea	TQ2877

Methods

Fieldwork was undertaken between December 2011 and September 2013 when every accessible 1-km Ordnance Survey (OS) coastal grid square (monad) in vice-county 16 (West Kent) was visited from the Isle of Grain to just beyond Greenland Dock near Deptford (Table 1). Several points were sampled within a monad and, using a hand-held GPS, these were georeferenced using OS grid references. Locations where species of particular interest were found were also georeferenced. Sampling was also undertaken in vice-counties 17 (Surrey), 18 (South Essex) and 21 (Middlesex) upriver to Putney (Table 1). Benthic algal recording was by direct observations for the obvious larger species; small species were sampled and identified by examination under the microscope. In many cases pressed specimens and microscope slides were prepared, registered and deposited in the marine algal herbarium of the Natural History Museum (**BM**). Georeferenced distributional data for vice-county 16 will be deposited at the Kent and Medway Biological Records Centre (KMBRC). In this paper I define river walls as the mostly vertical structures in the low salinity inner reaches of the tidal Thames above Woolwich to Teddington, and sea walls as the mostly sloping structures below Woolwich to the mouth of the estuary at Shoeburyness and Sheerness.

Algae were identified using standard manuals and keys (Brodie and Irvine 2003; Brodie et al. 2007; Bunker et al. 2010; Dixon and Irvine 1977; Fletcher 1987; Irvine 1983; Maggs and Hommersand 1993). Brief descriptions are given for those species new to the estuary; for others see Tittley (2009*a*). Nomenclature and taxonomy were updated according to the latest version of *Algaebase* (Guiry and Guiry 2013).

Results

New records and observations

Rhodophyta, Bangiophycideae, Goniotrichales, Goniotrichaceae

Stylonema alsidii (Zanardini) K. Drew

This is a new record for the Thames Estuary. This alga is formed of purple-red microscopic branched uniseriate filaments a few mm long that are surrounded by a thick gelatinous layer. It grew on larger algae, in man-made swimming pools at midlittoral level, at Leigh and Canvey Island (Figure 1), Essex.

Bangiales, Bangiaceae

Bangia atropurpurea (Roth) C. Agardh

The species was recorded previously on river walls at upper littoral levels among green algae. In late spring 2012 it was found at Westminster, Vauxhall and Battersea. At Vauxhall (Figure 2), where the salinity is very low (an average of 3 parts salt per thousand of water (ppt); normal seawater is 33 ppt), it formed a visually recognizable narrow, broken band on the basal parts of river walls at midlittoral level.

Porphyra linearis Greville

The species was previously recorded only at Sheerness; in December 2011 it was found a little further west on the Isle of Grain and at Allhallows at upper littoral levels on sea walls.

Porphyra purpurea (Roth) C.Agardh

Although reported previously upriver as far as Greenhithe, in 2011 and 2012 it was recorded commonly along the Hoo penisula to Lower Hope Point, and sporadically at sites to Northfleet. It was locally common near Cliffe Fort and is a consistent feature of the algal flora on both coasts of the lower Thames.

FIGURE 1. Fucoid-covered sloping sea wall on Canvey Island, Essex, and a tidal swimming pool in the background, September 2013.

FIGURE 2. Near-vertical brick river wall at Vauxhall with a cover of mainly green algae at upper littoral levels, May 2012.

FIGURE 3. The red alga *Rhodochorton purpureum* growing in a shaded location at high tide level on a brick river wall at Greenwich, November 2012.

FIGURE 4. Canopy of *Fucus vesiculosus* and *Ascophyllum nodosum* on sea wall at Canvey moved to reveal an underflora dominated by the red alga *Gelidium pusillum*, September 2013.

Porphyra umbilicalis (Linnaeus) Kützing

Previously recorded only at Sheerness but in 2012 it was found on sea walls at upper littoral levels further upriver at Allhallows and west of Egypt Bay by Blythe Sands.

Florideophycideae, Acrochaetiales, Acrochaetiaceae

Acrochaetium secundatum (Lyngbye) Nägeli

Previously known only from Canvey Island, Essex; in 2012 it was found on the opposite side of the Thames on the Hoo peninsula near West Point, St Mary's Bay, where it grew as an epiphyte on *Chondrus crispus* and *Gelidium pusillum* at upper midlittoral level.

Rhodochorton purpureum (Lightfoot) Rosenvinge

The species was previously described as growing at mid and upper littoral levels in shaded situations (beneath the *Fucus* canopy) in the outer estuary on sea walls and other structures not uncommonly as far upriver as Wapping. In 2012 it was recorded in most monads in the lower and middle estuary and was particularly common on river walls in shaded situations in the Greenwich area (Figure 3) and detected further upriver at Bemondsey.

Palmariales, Rhodothamniellaceae

Rhodothamniella floridula (Dillwyn) Feldmann

An underflora species previously reported as growing at midlittoral levels on sea walls at a few places in the outer estuary. Fieldwork in 2012 revealed the species to occur commonly in the same habitat further upriver to Shornmead Fort.

Gelidiales, Gelidiaceae

Gelidium pusillum (Stackhouse) Le Jolis

An underflora species previously reported growing on seawalls and other structures at midlittoral levels in the outer estuary to Egypt Bay and Canvey Island (Figure 4); in 2012 it was found in the same type of habitat further upriver on the Kent coast to Lower Hope Point, at Shornmead Fort, and at the base of the vertical sea wall at Northfleet.

Gracilariales, Gracilariaceae

Gracilariopsis longissima (S. G. Gmelin) Steentoft, L. M. Irvine and Farnham

Previously recorded from the Isle of Grain growing on stones and shells in standing water; in 2012 it was found growing in a similar habitat further upriver at Egypt Bay.

Hildenbrandiales, Hildenbrandiaceae

Hildenbrandia crouaniorum J. Agardh

A species found for the first time in the Thames Estuary at Allhallows where it grew on stones and cobbles at midlittoral level. This discoid crustose alga is distinguished from *H. rubra* by its zonately (versus obliquely) arranged tetraspores.

Hildenbrandia rubra (Sommerfelt) Meneghini

Previously recorded on stones and cobbles at Sheerness but now known to occur further upriver at Allhallows and Gravesend, and on the Essex coast at Canvey.

Gigartinales, Caulacanthaceae

Catenella caespitosa (Withering) L. M. Irvine

Previously recorded only in the outer estuary on Grain and Canvey islands. In 2012 it was recorded at upper littoral levels on sea walls and in fringing saltmarsh further west along the Hoo peninsula to Lower Hope Point and at Eastcourt Marshes to the east of Gravesend.

Dumontiaceae

Dumontia contorta (S. G. Gmelin) Ruprecht

This early-season red alga was previously recorded at Sheerness, Grain and Canvey. In 2012 it was found attached to stones in shallow standing water at Allhallows.

Ceramiales, Ceramiaceae

Aglaothamnion hookeri (Dillwyn) Maggs and Hommersand

This small under-canopy species was previously recorded on sea walls at Canvey and Egypt Bay. In 2012 it was found in this habitat at sites west of Egypt Bay along the Hoo peninsula to Lower Hope Point, at Cliff Fort, Shornmead Fort, Eastcourt marshes and on a wood groyne at Gravesend.

Ceramium botryocarpum Griffiths ex Harvey

A new record for the Thames Estuary found at Shoeburyness and Canvey. This filamentous red alga is distinguished from *C. virgatum* Roth by the presence of adventitious branchlets. It grew as an epiphyte on other algae in shallow standing water and occurs commonly on the north Kent coast.

Ceramium gaditanum (Clemente y Rubio) Cremades

Previously recorded on the sea wall at Canvey; in 2011 and 2012 it was found in similar habitats at Grain and Egypt Bay.

Pterothamnion plumula (Ellis) Nägeli

A new species record for the Thames Estuary formed of pink feathery tufts of filaments to 50 mm tall (in the Thames), branched in one plane, with a dichotomously branched main axis that bears paired distichously arranged branches that in turn bear on their upper surfaces smaller branchlets. Gland cells are commonly present on branchlets, borne adjacent to a single cell and often conical in shape.

The species occurred just below water level on the inner walls of a tidal swimming pool on Canvey Island.

Rhodomelaceae

Bostrychia scorpioides (Hudson) Montagne ex Kützing

This red alga, rediscovered in the saltmarshes of the Thames Estuary, comprises tufts of blackish-red filaments that grow to 60 mm in length. It has a main axis that bears alternately or distichously arranged branches; the ultimate branches are straight and spine-like tapering gradually to pointed apices. A notable feature is the inrolled tendril-like tips to the branches on the lower side of the thallus. Plants are attached to the substratum by peg-like haptera that develop on prostrate filaments. The filaments are corticated and polysiphonous with six or seven primary periaxial cells. Reproductive structures occur sporadically with tetrasporangia formed in stichidia (pod-like branchlets) in late summer.

Previously (Tittley and John 1998; Tittley 2001) it was suggested that *Bostrychia scorpioides* was absent from, or had become extinct in, the Thames Estuary due to the extensive loss of riparian saline wetland. It may, however, have been overlooked. Recently, a historical herbarium specimen of *B. scorpioides* located to between Northfleet and Gravesend was discovered in the unincorporated collection of John Lightfoot at **BM** (Bryant et al. 2012; Tittley 2005, 2009*a*). This suggested, assuming the specimen to have been attached, that the species occurred there in the late eighteenth century when the coastline would have been marshy prior to the land claim and industrial development of the nineteenth century. Across the estuary in south Essex there are also historical records of *Bostrychia scorpioides* from Southend and Canvey Island (Tittley 2009*b*).

Fieldwork at Two Tree Island near Leigh on Sea in September 2011 revealed *Bostrychia scorpioides* for the first time recently in the Thames Estuary. It grew on and amongst *Atriplex portulacoides* Linnaeus at upper littoral levels. In February 2012 *B. scorpioides* was discovered across the estuary in Kent associated with *A. portulacoides* in upper littoral saltmarsh fringing Yantlet Creek on the Hoo peninsula and also in scrappy saltmarsh at Allhallows. Further field surveys of monads upriver along the Kent side of the Thames Estuary in 2012 and early 2013 revealed the species to be present in saltmarsh habitats to Crossness near Thamesmead (Figures 5 and 6; Table 2).

FIGURE 5. The red alga *Bostrychia scorpioides* among secondarily formed saltmarsh at Thamesmead, December 2012.

FIGURE 6. Secondary saltmarsh on the sea wall that creates habitat for *Bostrychia scorpioides* at Thamesmead, December 2012.

FIGURE 7. Near-vertical river wall at Wapping; the brick wall in the foreground is covered by green algae while the concrete wall in the background has a less-extensive cover, May 2012.

FIGURE 8. *Fucus vesiculosus* covering the sloping sea wall at upper littoral levels at Woolwich Arsenal, December 2012.

TABLE 2. Occurrence of *Bostrychia scorpioides* in the Thames Estuary.

Grid ref.	Location	Habitat
TQ483812	Crossness, Thamesmead	On *Aster tripolium* and boulders
TQ534781	Erith saltings	Among *Phragmites australis* and *Cochlearia* sp.
TQ549774	Long Reach, by Dartford Marshes	On *Aster tripolium*
TQ558767	Littlebrook	On *Atriplex portulacoides*
TQ607767	Swanscombe, Broadness Marsh	On *Atriplex portulacoides* and among *Puccinella maritima*
TQ610764	Swanscombe, Broadness Marsh east	On *Atriplex portulacoides*
TQ676743	Gravesend east, by Eastcourt Marshes	Among *Puccinellia maritima*, *Plantago maritima*, *Spergularia* sp. and on clay
TQ707768	Cliffe Fort	On *Atriplex portulacoides*
TQ709757	Higham Marshes	On *Atriplex portulacoides* and among *Spartina anglica*
TQ711781	Cliffe Marshes, Lower Hope	On *Atriplex portulacoides*
TQ719791	Lower Hope Point	On *Atriplex portulacoides*
TQ723793	Lower Hope Point north	On *Atriplex portulacoides*
TQ738793	Cliffe Marshes	On *Atriplex portulacoides*
TQ740792	Cliffe Marshes, by Blyth Sands	On *Atriplex portulacoides* and *Inula crithmoides*
TQ751792	Cliffe Marshes, by Blyth Sands	On *Atriplex portulacoides*
TQ761793	Cliffe Marshes, by Blyth Sands	On *Atriplex portulacoides*
TQ795789	St Mary's Bay	On *Atriplex portulacoides*
TQ818783	St Mary's Marshes	On *Atriplex portulacoides*
TQ823785	Allhallows west, Dagnam Saltings	On *Atriplex portulacoides*
TQ832848	Two Tree Island, Essex	On *Atriplex portulacoides*
TQ855783	Yantlet Creek	On *Atriplex portulacoides*

Polysiphonia atlantica Kapraun and J. N. Norris

Previously recorded as an underflora species on sea walls at Sheerness and Gravesend. Recent fieldwork has recorded it in similar habitats in almost all monads from Grain to Gravesend and a little further upriver at Northfleet. It may have been temporarily present at Greenhithe in 1992 (see below); reassessment there in January 2001 and October 2012 failed to relocate the species.

Polysiphonia denudata (Dillwyn) Greville ex Harvey in W. J. Hooker

This species new to the Thames Estuary comprises brownish tufts of branched filaments to 60–70 mm tall. Filaments are profusely dichotomously branched and decrease in diameter towards the apices. The filaments are ecorticate and formed of six or seven periaxial cells that surround a central axial cell.

Tufts of this alga grew just below water level on the inner walls of a tidal swimming pool on Canvey Island.

Polysiphonia nigra (Hudson) Batters

Brownish-red thin tufts of branched filaments that grow to 70 or 80 mm tall; filaments are ecorticate and have seven or eight periaxial cells that surround a central axial cell.

Filaments were collected from below water level on the inner wall of a tidal swimming pool on Canvey Island.

Polysiphonia stricta (Dillwyn) Greville [*P. urceolata* (Lightfoot ex Dillwyn) Greville in Tittley and Price 1977; Tittley and John 1998]

In 1992 *Polysiphonia stricta* was recorded as an underflora species on the sea wall beneath a canopy of *Fucus vesiculosus* (Tittley 2001) at Greenhithe; unfortunately a

specimen was not retained for confirmation of the determination but on the basis of recent fieldwork it is suggested that the alga was probably *Polysiphonia atlantica* (see above).

Fieldwork in January 2001 revealed a species of *Polysiphonia* with four periaxial cells, identified as *P. stricta*, for the first time at Woolwich (Bell Water Gate slipway near Woolwich Ferry) growing in a moist niche on the river wall at midlittoral level (specimen in **BM**). Reinvestigation in December 2012 failed to relocate the species.

In May 2012 a *Polysiphonia* (provisionally referred to *P. stricta*) was found among green algae at upper littoral levels on the north-facing brick river wall at Bermondsey approximately 12 km upriver of Woolwich. This is the furthest upriver that a *Polysiphonia* has been found, a reach where the salinity is low (average of 4 ppt, possibly lower when increased fresh water flows into the river).

Chlorophyta, Trebouxiophyceae, Prasiolales, Prasiolaceae

Prasiola stipitata Suhr ex Jessen

This small green alga grows at supralittoral levels on sea walls in nutrient-rich situations where birds have been standing. Previously it was known only from Canvey Island and Egypt Bay. Recent fieldwork has revealed it to occur at Leigh on Sea and Shoeburyness, Essex, in the outer estuary and further west along the Hoo peninsula to Gravesend.

Rosenvingiella radicans (Kützing) Rindi, McIvor and Guiry

The discovery in December 2012 of this species at Woolwich is a new species record for the Thames Estuary, Kent (*sensu lato*) and the southeast of England. *Rosenvingiella radicans* is a small filamentous species with uniseriate filaments 7–20 μm wide, attached by rhizoidal cellular protrusions, singly and in pairs on adjacent cells. It was first discovered at Bell Water Gate, Woolwich, on the brick river wall by the slipway above high tide level, overlapping with a supralittoral zone of bryophytes where conditions are moist and nutrient enriched. *Rosenvingiella radicans* was subsequently found at supralittoral levels on a wood piling at the eastern end of Woolwich Arsenal.

Ulvophyceae, Ulotrichales, Ulotrichaceae

Ulothrix flacca (Dillwyn) Thuret in Le Jolis

This small filamentous species was previously known to grow on sea walls at midlittoral levels at only a few places in the estuary. In 2012 it was recorded in similar habitats on the Isle of Grain, at several locations along the the Hoo peninsula, at Jenningtree Point near Belvedere, and much further upriver on the vertical river wall at Chelsea (vc 21).

Ulothrix implexa (Kützing) Kützing

This small green alga is a new species record for the Thames Estuary. It is formed of straight or curled uniseriate, unbranched, filaments 3.5–25 μm wide attached by a rhizoidal cell with downgrowing rhizoids. It grew at upper littoral levels among other green algae on wood pilings, in poorly formed saltmarsh at Crosssness near Thamesmead, and in the outer estuary at Yantlet Creek.

Ulothrix speciosa (Carmichael ex Harvey in Hooker) Kützing

A small green alga that is similar to the previous two species and a new species record for the Thames Estuary. It is formed of uniseriate, unbranched filaments with cells 30–70 μm wide, and shorter in length than width, attached by a basal cell. The outer cell walls are smooth surfaced without micro particles. It grew in saltmarshes and on wood structures in the outer estuary (Yantlet Creek, Allhallows, St Mary's Bay).

Ulothrix subflaccida Wille

A new record found in the outer estuary at Shoeburyness. It is similar to the previous species but with filaments less than 12 μm wide and attached by a single tapering rhizoidal cell. It grew on rocks at upper littoral levels.

Urospora wormskioldii (Mertens ex Hornemann) Rosenvinge

This is the first record of this filamentous green alga in the Thames Estuary. Its unbranched filaments are formed of large barrel-shaped cells 100–500 (–1,200) μm wide. It grew at upper littoral levels on the sea wall at Grain.

Ulvales, Ulvaceae

Percursaria percursa (C. Agardh) Rosenvinge

This is the first record of this filamentous green alga in the Thames Estuary. The filaments form tangled or woolly masses and are biseriate (having two rows of cells), 25–30 μm wide and 18 μm thick. The species occurred among other green algae in damp to wet situations in saltmarshes in the outer estuary at Allhallows, Lower Hope Point and Higham Marshes.

Ulva (formerly *Enteromorpha*) *compressa* Linnaeus

This species was previously noted as under recorded in the estuary (four sites); recent fieldwork has found it in most monads from Grain to Greenhithe. It was recorded sporadically upriver to Thamesmead and occasionally on the river walls at Bermondsey (vc 17) and Wapping (vc 21; Figure 7).

Cladophorales, Cladophoraceae

Cladophora glomerata (Linnaeus) Kützing

Previous studies (Tittley and Price 1977; Tittley and John 1998; Tittley 2001) have reported a *Cladophora* species and a '*Cladophora* freshwater species' from the inner reaches of the tidal Thames. Brodie et al. (2007) described three *Cladophora* species (*C. glomerata*, *C. globulina* (Kützing) Kützing, *C. fracta* (O. F. Müller ex Vahl) Kützing) for Britain that are freshwater species penetrating into brackish waters. John et al. (2011) described only a single *Cladophora* species (*C. glomerata*) from fresh waters (*C. fracta* is synonymous). The sparsely branched, sometimes unbranched, uniseriate filamentous alga (main axes to 150 μm) found in the inner Thames corresponds to the descriptions of *C. glomerata*. It is a species not previously recorded in the estuary, and occurs from Kew to Thamesmead (Table 3) where the salinity is low.

TABLE 3. Occurrence of *Cladophora glomerata* in the tidal Thames.

Grid reference	Location	Salinity ppt
TQ177777	Kew	0
TQ241756	Putney	2
TQ281778	Chelsea	3
TQ296377	Battersea	3
TQ303782	Vauxhall	3
TQ303380	Westminster	4
TQ311808	Blackfriars	4
TQ355380	Wapping	4
TQ385780	Greenwich, Queen's Stairs	5
TQ390784	Greenwich east	5
TQ400793	Greenwich peninsula east	5
TQ429792	Woolwich west	7
TQ475814	Crossness, Thamesmead	13

Bryopsidophyceae, Bryopsidales, Bryopsidaceae

Bryopsis plumosa (Hudson) C. Agardh

Previously recorded on the Isle of Grain, Kent, but now found a little further up the estuary at Leigh, Essex, where it grew on the sides of a man-made tidal swimming pool.

Ochrophyta, Phaeophyceae, Sphacelariales, Sphacelariaceae

Sphacelorbus nanus (Nägeli ex Kützing) Draisma, Prud'homme et Kawai [*Sphacelaria nana* Nägeli ex Kützing in Tittley 2009*a*]

This small filamentous brown alga forms a turf on sea walls under the *Fucus* canopy and was previously noted for only two sites in the outer estuary (Sheerness, Canvey). Recent field studies have revealed the species to be present as underflora on sea walls in many monads from Grain to Long Reach.

Dictyotales, Dictyotaceae

Dictyota dichotoma (Hudson) J. V. Lamouroux

This new species for the Thames Estuary is a yellow-brown, dichotomously branched, ribbon shaped plant that grows to 100 mm long. Thalli have entire margins, may be narrow and twisted, have a distinct large apical cell, and are attached by a basal mat of filaments. Drift (unattached) plants were found at Grain and further west along the Hoo peninsula at Blythe Sands by Cliffe marshes. In September 2013 an attached population was found on Canvey Island growing on stones and shells in standing water. It confirmed an historical (around 1800), probably drift, record for nearby Southend (Tittley 2009*c*).

Ectocarpales, Chordariaceae

Elachista fucicola (Velley) Areschoug

This small epiphyte on *Fucus vesiculosus* was previously recorded widely in the estuary as far as Greenhithe and Purfleet and found in October 2012 on the opposite bank of the river by Dartford Marshes and four kilometres further upriver at Belvedere.

Ralfsiales, Ralfsiaceae

Pseudolithoderma extensum (P. Crouan and H. Crouan) S. Lund

A new species for the Thames Estuary that takes the form of blackish-brown thick crusts that closely adhere to the substratum. The thallus comprises inseparable upright filaments to twenty-two cells long each with six plastids (distinguishing it from *Ralfsia verrucosa* (Areschoug) J. Agardh, the cells of which have a single plastid). It grows on stones on the foreshore at midlittoral level and is currently found only on Grain.

Fucales, Fucaceae

Ascophyllum nodosum (Linnaeus) Le Jolis

This large brown alga was previously recorded in the outer estuary to Canvey Island (Figure 1) and Egypt Bay. Recent field studies have found it growing on sea walls in most monads from Grain to Gravesend, and as drift material at Northfleet, Broadness and Greenhithe.

Fucus vesiculosus Linnaeus

Dense growths are a characteristic feature on sea walls at upper littoral levels (e.g. Canvey Island, Figures 1 and 4) westwards to Barking Point and Tripcock Ness, Thamesmead. Recent fieldwork revealed substantial but less continuous populations on the sea wall further upriver at the eastern end of Woolwich Arsenal (Figure 8). The small population found on the slipway at Bell Water Gate, Woolwich, in 1992 has not been relocated in recent surveys.

Discussion

Species new to the Thames Estuary

The recent suite of field studies has revealed 16 species of benthic marine algae new to the Thames Estuary comprising 7 Chlorophyta, 7 Rhodophyta and 2 Phaeophyceae. This increases the total number of species known for the estuary to 77 comprising 32 Chlorophyta, 31 Rhodophyta, 13 Phaeophyceae

(Ochrophyta) and 1 Xanthophyceae (Ochrophyta). The greater number of Chlorophyta reflects the brackish nature of the inner tidal river where green algae predominate; red algae by contrast are mostly restricted to the more saline outer estuary.

Of the seven species of Chlorophyta new to the estuary *Cladophora glomerata* is an indicator species for the brackish conditions that prevail between Kew and Thamesmead. The discovery of *Rosenvingiella polyrhiza* in the inner estuary at Woolwich is a new record for southeast England of a species poorly known in Britain but which has more recently been found on the Isle of Sheppey (Tittley 2014, in press). It is a member of a family of algae (Prasiolaceae) that colonizes nutrient-rich habitats. The related *Prasiola stipitata* is currently known only from the outer estuary. The filamentous *Percursaria percursa* found in damp areas of saltmarsh is a species that may have occurred more widely in the estuary prior to drainage and loss of saline wetland that now occurs only sporadically. The new records of *Ulothrix implexa*, *U. speciosa* and *Urospora penicilliformis* are species that occur widely in Britain and would have been expected to occur in the estuary; they were probably previously overlooked. Recent fieldwork has not revealed any further migration upriver of *Ulva lactuca* from Dagenham and Crossness as reported by Price (1982); it was not found at Crossness in December 2012 despite being sought.

Dictyota dichotoma is a common element of the marine algal flora of Kent and grows at least as far west along the north Kent coast as the Medway Estuary (Tittley 2012). The new record of *Pseudolithoderma extensum* is of a species of sporadic occurrence in southeastern England and is a crustose form easily overlooked or confused with other crustose species. It has been only sporadically recorded in Kent. The same is true for the crustose red alga *Hildenbrandia crouaniorum* recorded as new to the estuary but known to occur in the Medway Estuary and sporadically elsewhere in Kent (Tittley 2009*b*). The occurrence of *Scytosiphon lomentaria* at Shoeburyness is a first record for the estuary and confirms an earlier historical record for Southend (Tittley 2009*c*); it occurs widely in Kent.

Man-made tidal swimming pools as on Canvey Island create an artificial lagoon habitat for subtidal algae including several mentioned in this paper (*Bryopsis plumosa*, *Polysiphonia denudata*, *P. nigra* and *Pterothamnion plumula*). *Bryopis plumosa* and *Pterothamnion plumula* occur commonly on floating pontoons in Chatham harbour in the Medway Estuary, Kent, while *Polysiphonia nigra* grows on stones and shells on the muddy sea-shore across the estuary on the Isle of Sheppey. *Polysiphonia denudata* is found commonly in natural rock pools on the chalk shores of east Kent.

The discovery of the saltmarsh-specific red alga *Bostrychia scorpioides* on the Essex and Kent coasts of the Thames Estuary upriver to Thamesmead in the brackish reach suggests the resilience of a species that has survived and spread (possibly from populations in the remaining pockets of natural saltmarshes of the outer estuary) despite the extensive loss of saltmarsh in the inner estuary. *Bostrychia scorpioides* has spread to secondary saltmarsh on or in front of sea walls perhaps reoccupying locations where it may have occurred prior to sea wall construction. At Broadness (Swanscombe peninsula), however, it occupies only the seaward fringe of saltmarsh and minor disturbance could cause its loss. In the outer estuary *B. scorpioides* grew mainly on *Atriplex portulacoides*, and occasionally on *Inula crithmoides* Linnaeus. Further into the estuary where *A. portulacoides* was less common, it grew on and among *Aster tripolium*

Linnaeus, *Plantago maritima* Linnaeus, *Puccinellia maritima* (Hudson) Parlatore, *Spartina anglica* C. E. Hubbard and *Spergularia* sp., and also on clay and boulders. The genus *Bostrychia* occurs worldwide and other species (e.g. *B. montagnei* Harvey) grow in mangrove habitats. The occurrence of *B. scorpioides* on the woody stems of *A. portulacoides* emulates this on a small scale.

The discovery of *Polysiphonia* sp. cf *stricta* or *subtilissima* in the inner reach of the tidal Thames where salinity averages 4 ppt or less is a new observation. *Polysiphonia* has not been reported from such low brackish (almost freshwater) conditions in Britain other than by Tittley (2001) for Woolwich (salinity 7 ppt). Tittley (2001) noted that *P. stricta* grows in areas of comparable low salinity in the Baltic Sea and that other populations resemble *Polysiphonia subtilissima* Montage (see also comments in Maggs and Hommersand 1993; Tittley and John 1998). *Polysiphonia subtilissima* has been found in freshwater environments in North America (Sheath and Cole 1990; Sheath et al. 1993). Further research is required to resolve the identity of the entity found at Woolwich and Bermondsey.

The occurrence of *Bangia atropurpurea* recorded on the river wall at Vauxhall at midlittoral level in late spring contrasts with its occurrence in late winter on the open Kent coast near high tide level. The *Bangia* from Vauxhall may perhaps be another species. *Bangia atropurpurea* grows in marine (cf Tittley 2012) and freshwater (cf John et al. 2011) conditions. The specimen sampled at Vauxhall is currently being reinvestigated by DNA analysis to resolve its identity.

Upriver distributions

Recent fieldwork reveals the westward occurrence into the tidal Thames of twenty-five species out of the sixty-four previously recorded. Does this indicate a migration of species upriver as suggested by Price (1982, 1983) for *Fucus vesiculosus* and *Ulva lactuca*? Or does it reflect the intensity of sampling in the present survey leading to improved data on algal occurrence in the tidal Thames? In general, although marine algal recording in Britain has improved in recent times, the tidal and subtidal coastline still remains under investigated.

The Thames Estuary is, as elsewhere in southeast England, a dynamic environment where change is ongoing. The natural geological process of isostatic readjustment following the last glaciation is causing the southeast of England to sink relative to tide level with a consequent marine transgression into the Thames Estuary. As a result the tidal Thames has become more saline and marine species have migrated further upriver (Attrill 1998). Human settlement and discharge of domestic and industrial waste into the river's waters resulted in the nineteenth and twentieth centuries in the extinction of most of its biota (Halliday 1999). The amelioration in water quality since the 1960s has encouraged the return of fauna and flora to the estuary (cf Attrill 1998).

Another significant change in the estuary concerns the riparian environment where the fringing saline wetland has been lost through land-claim, and river and seawalls have been constructed as quays for shipping, and to halt erosion and prevent flooding. This has taken place on a large scale along the tidal Thames, and, at upper littoral levels, its coast is now a rocky environment; this change is not confined to the Thames but has happened widely in southeast England and the southern North Sea (Tittley 2013). Hard substrata have facilitated the spread of epilithic algae along the Thames Estuary. Many of the seaweed species referred to in this and previous papers that occur on sea walls would otherwise be absent or scantily present. *Ascophyllum nodosum*, for example, occurs rarely on natural rock in Essex, Kent and Sussex, being absent

from Chalk and present only on the Lower Greensand rock outcrop at Folkestone, Kent, otherwise as the stunted form ecad *scorpioides* in the Blackwater Estuary, Essex. It perhaps spread to the Thames Estuary by fertile drift material being washed onto sea walls, where gametes were released, fertilization effected, and zygotes settled onto the firm rocky substratum. *Ascophyllum nodosum* has probably spread widely by this means in Essex and north Kent. The obligate epiphyte on *A. nodosum*, *Vertebrata* (*Polysiphonia*) *lanosa* (Linnaeus) T. A. Christensen is currently absent in the Thames Estuary as is its microscopic red algal parasite *Choreocolax polysiphoniae* Reinsch. Both are present at Folkestone. Does this suggest that at Folkestone *A. nodosum* forms an older successionally more mature assemblage compared with that on Thames sea walls? Recent fieldwork on the south, Swale, coast of Sheppey revealed a drift specimen of *A. nodosum* with the epiphyte *V. lanosa* suggesting the potential for dispersal to the estuary (Tittley 2014, in press). *Fucus vesiculosus*, by contrast, has a longer historical pedigree in the Thames Estuary (Tittley 2005), being present on erratic boulders, mussel beds and other firm substrata. Sea walls have encouraged the spread of *F. vesiculosus* and the formation of a dense canopy of growth up the estuary to Woolwich. Its small brown algal epiphyte, obligate on fucoid species, *Elachista fucicola*, unlike *Vertebrata lanosa*, occurs commonly in the estuary upriver to Belvedere.

Conclusions

The marine and brackish environment of the tidal Thames currently supports a healthy benthic algal flora of seventy-seven species. Most of these inhabit firm man-made rocky substrata, but where there is natural or secondarily formed saltmarsh the characteristic algal community of wetland habitat is present. Further fieldwork remains to be undertaken on the Essex side of the estuary to complement the observations and records for the Kent side. Floating piers, pontoons and buoys above Gravesend have still to be sampled and have the potential to yield new records. The London reaches of the tidal river have a uniform algal flora mostly of green algae in response to the low salinity conditions that prevail there but with more red algae at Bermondsey. The algal data obtained from the detailed recording undertaken in the present survey sets a firmer baseline for monitoring change although qualitative data has limitations. Future monitoring is best served by acquiring and assessing quantitative data at selected sites along the estuary.

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Book review

A slow passion: snails, my garden and me. Ruth Brooks. 2013. Bloomsbury. 238 pp. Hardback, £12.99. ISBN 978 1 4088 2568 4, eBook £14.99.

I largely gave up watching TV or reading newspapers some time ago. One of the ways new technology allowed this was the Podcast: downloadable radio programmes that could be listened to whilst walking the dog or trudging round the supermarket. This meant I could listen to programmes that I liked but were on at times I could not regularly listen in. One of these is *Material World* presented by the excellent Quentin Cooper. During 2011, the podcast featured a series entitled 'So You Want to be a Scientist', where members of the public put up ideas for scientific research and then got the chance to work with professional scientists to test their ideas. As someone who has done some, very limited, university research and some mark and recapture work on the snails in my garden, I was fully behind the decision to award the winner's prize to Ruth Brooks, a senior citizen with interests that included gardening and wildlife.

This charming, gentle, entertaining and thought-provoking book is the story of Ruth's lifelong love-hate interest in the snails that eat her garden plants, and her application and eventual success in the BBC competition. She is a 'natural' naturalist and a very engaging writer, and any lover of natural history will immediately fall in with her interest and quest. The question she posed is 'do snails have a homing instinct?', born from her efforts to transplant snails away from her tasty garden plants rather than boil or poison them. The book follows the story of her early interest in snails and other wildlife, through her ideas on snail control, to how the application and selection of the BBC's Amateur Scientist of the Year worked out. Anyone can enjoy this book, even the most qualified scientist or natural historian as well as the pottering gardener. Whilst some may consider chasing snails with a torch and 'pale apricot bon bon' nail varnish makes her an eccentric, I think that anyone with an interest in natural history will be captivated. It is a human story as well as a story of science, and has a healthy dose of nostalgia to engage the reader. At about a tenner for the nicely-made hardback, I think it would make an excellent present for a wide range of people, and would be an inspiration for anyone taking a greater interest in natural history in later life.

MICK MASSIE

Spiders and management of Clinton Road Meadow at Mile End Park, London Borough of Tower Hamlets, 2005–2012

J. E. D. MILNER
80 Weston Park, London N8 9TB

Abstract

A study of spiders on Clinton Road Meadow, Mile End Park, London Borough of Tower Hamlets, using pitfall-traps over an eight-year period from 2005 to 2012, revealed changes in the fauna thought to be due to changed management from heavy regular mowing to no mowing at all, affecting the structure of the vegetation which the spider fauna responded to. Total numbers of spiders varied but generally reduced from 2005 onwards while diversity (species richness) increased, even though five small pioneer species disappeared to be replaced by several (larger) grassland species. There was evidence of a succession of wolf spiders, with the 'pioneer' *Pardosa palustris* being replaced by grassland species *Pardosa pullata* and the larger *Alopecosa pulverulenta*. Total spider biomass increased, although numbers and biomass decreased in 2012; this was interpreted as having been influenced by the cool, damp summer.

Introduction

The Clinton Road (formerly Ashcroft Road) Meadow is a small relic of old grassland in a corner of Mile End Park immediately south of the Liverpool Street to Stratford railway line where it crosses over Grove Road. Historically, the road was longer, extending to the canal and it was then known as Ashcroft Road. The area between this road and the railway embankment appears never to have been built on (P. Mernicks, East London Historical Society, pers. comm.) or even tarmacked over, but the land was successively occupied by a brush maker, a tram depot, a paintworks, and in the 1940s and 1950s, a parking area for a London Transport bus garage. It was incorporated into Mile End Park some time before 2000. In 2004, when the writer first visited the site, the meadow was heavily mown and looked more like a lawn dominated by a few plant species such as *Plantago lanceolata*, *Agrostis stolonifera*, *Dactylus glomeratus* and some *Festuca rubra,* together with some vetches and trefoils. Unlike other 'recreation-ground grassland' within the Park, this small area showed no sign of having been reseeded with *Lolium perenne*. It was fairly heavily trampled and used by the public.

There was some compaction of the soil due largely to the frequent mechanical mowing and trampling by the general public, which had produced a homogenous habitat with very limited biological diversity and little or no flowering of most of the plants. Features such as grass tussocks and anthills which would occur on less-disturbed urban grassland, were both absent.

It looked like typical London park grassland, but closer inspection suggested that there was some floristic diversity which was being suppressed. Unfortunately no botanical survey was done at the time, so the detailed composition of the vegetation in 2004 is not known, but in recent years collections have been made and a provisional plant list produced. So far sixteen grass species have been recorded, but not *Lolium perenne*.

The author recognized this area as having some botanical diversity and the potential to develop as rough grassland with some conservation value. In 2004, as part of a preliminary invertebrate survey for the Park managers, a trio of pitfall traps was set in Area A (Figure 1). Advice offered by the writer to the park manager (Michael Rowan) was to relax the mowing regime, at first down to one autumnal cut, and subsequently (from 2007 onwards) to abandon mowing entirely in Area A, cutting just the desire lines in Area B. This advice was accepted and from 2007 onwards part A was not mown at all, while in part B only the main desire-lines were cut. This regime has continued until the present (early 2013). The result was a major change in the structure of the vegetation.

Gradually, new flowering plants have appeared (especially since 2007), *Dactylus glomeratus* tussocks have developed, and the whole meadow has become much more uneven and diverse; more like natural grassland. In area A anthills (built by meadow ants *Lasius flavus*) began to appear from 2008/9 so that by 2011, thirty-seven anthills were counted, several of which are now (2013) covered with *Festuca rubra* plants.

In late November 2011 the mowing sub-contractor mistakenly mowed most of part B and half of part A damaging the vegetation by demolishing several *Dactylus* tussocks and destroying most, but not all, of the anthills. Where the lost anthills had been were small patches of bare earth. During 2012 these bare patches gradually became covered with similar vegetation to the adjacent grassland, and several new anthills have since developed.

Meanwhile the trapping in Area A, which started in late 2004, has continued throughout the whole period and continues today; this is a report of the findings up to the end of 2012.

Nomenclature of the spiders is according to Harvey et al. (2002).

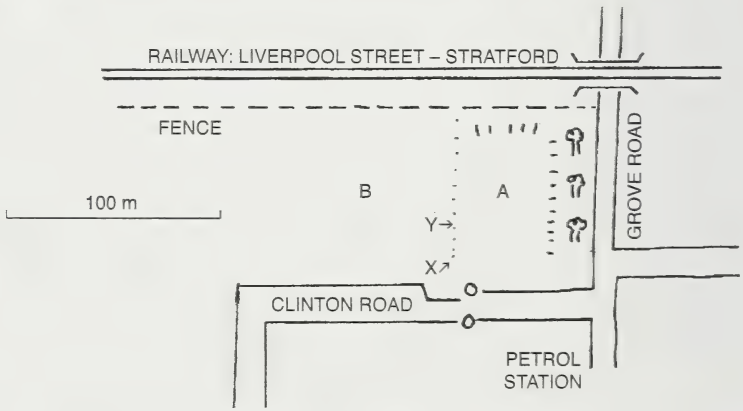

FIGURE 1. Sketch map of Clinton Road Meadow. A — study area; B — extended meadow; X — viewpoint for Figures 4, 5, 7; Y — viewpoint for Figure 3; → — direction of lens.

Materials and methods

Three standard pitfall-traps were set within a one-metre circle in the middle of the meadow (Area A), using a small quantity of concentrated anti-freeze plus some commercial detergent as a wetting agent, emptied on a monthly basis and the aggregated catches sorted. This started in 2004, and has continued to the present. The data presented refer to the eight complete years 2005–2012.

The physical damage to the site in 2011 just missed the trapping site which was not damaged; indeed, one substantial anthill has subsequently developed inside the triangle made by the three traps.

A botanical survey was conducted in 2012 and a plant list produced (identifications by David Bevan); this does not include any assessment of the relative frequency of different plant species, except to note that several anthills are covered in *Festuca rubra* alone, and there are several grass tussocks of *Dactylus glomeratus*. No precise measurements of structural changes in the vegetation were made (indeed there is no simple technique that is generally accepted for doing this).

Results

A summary of each complete year of trapping is given in Table 1, and comparable data exhibited in Figure 2. A complete list of spiders recorded from the meadow is given in Table 2, and a plant list in Table 3.

Spider numbers varied between 952 in 2005 and 530 the following year, with other years falling between these totals, and the mean being 670. The particularly damp cool summer of 2012 must have depressed numbers somewhat, as it did at other sites in the area (elsewhere in Mile End Park and at seven sites in Tower Hamlets Cemetery Park).

During the trapping period altogether seventy-one species of spider were recorded from the meadow, but only six of these were trapped in every year from 2005 to 2012 (*Centromerita bicolor, Lepthyphantes tenuis, Pachygnatha degeeri, Pardosa pullata, P. prativaga* and *Alopecosa pulverulenta*). The number of species (species richness) varied from 31 to 35 (mean 30.25) but there were some changes in the fauna which these raw figures conceal. In 2005 the count included five pioneers which gradually disappeared during the study period; without them the total in 2005 was low (26) for any grassland site in London. By 2012 the species richness of the catch had increased considerably even though three of the pioneers had disappeared. Excluding the pioneers, the average species richness for the first four years was 26.25; for the last four years it was 29.50.

In addition to the basic numbers of spiders and species, Figure 2 also includes calculations of spider biomass. Spiders were grouped into three categories: small (approx. 2.5 mm or less), medium (around 5 mm) and large (around 7.5 mm), given a rating of 1, 2 and 3, and this figure, approximating to a unit of length was then squared to get a biomass figure for each species. The resulting biomass figures show that the total increased from 1,725 in 2005 to a peak of just over double that figure (3,477) in 2009, although it dropped back a little since, especially in 2012.

Discussion

A casual reading of the data could suggest that while the meadow looks very different as a result of the changes in management, there has hardly been any

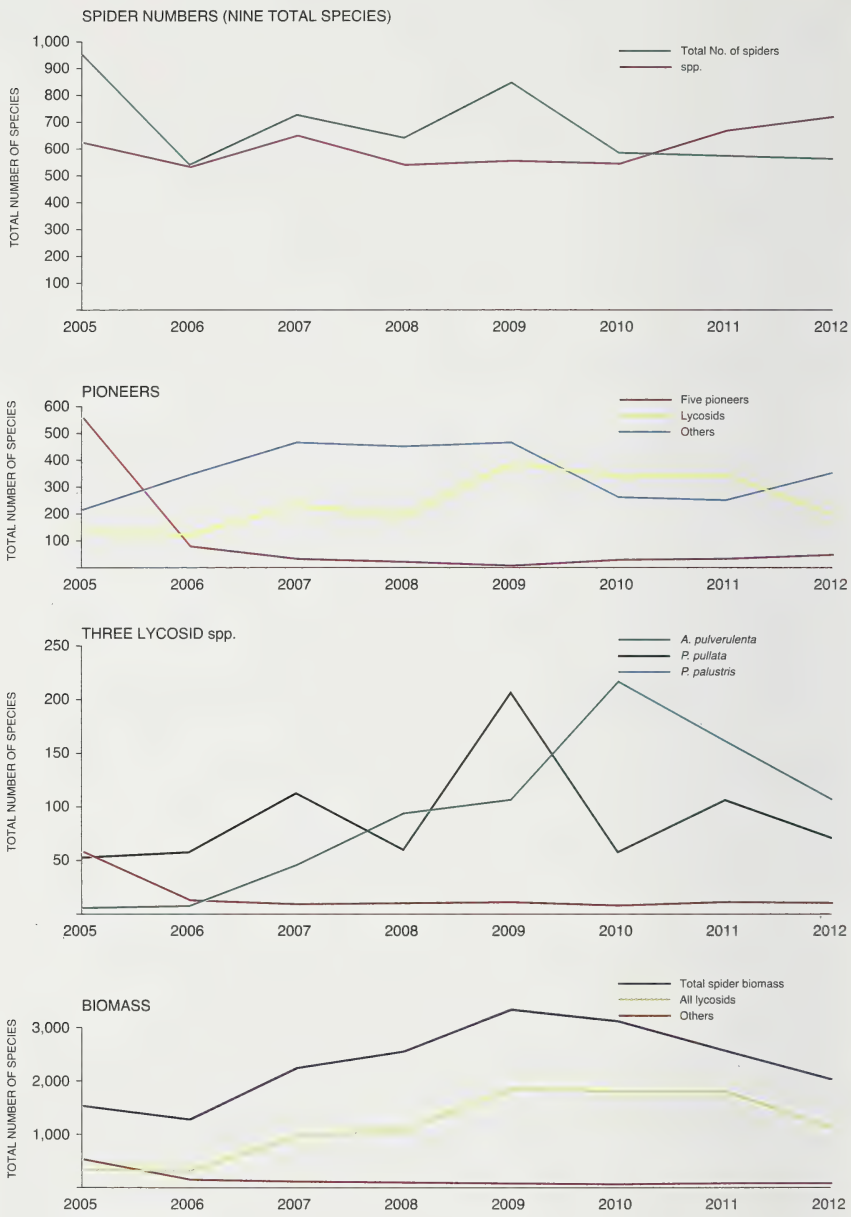

FIGURE 2. Graphs showing variation of spider species, numbers and estimated biomass.

benefit to the spider fauna, but that would be misleading. The structure of the habitat has changed considerably from a fairly uniform herb layer of a few inches (when the meadow was regularly mown) to a structurally diverse sward including varying heights of grass, tussocks and anthills; it is likely that it is the changes in the physical structure of the vegetation that have been the greatest influence on the spider fauna in the meadow.

Spiders found in London grasslands, from back lawns and recreation grounds to fragmentary relics of ancient (unimproved) grassland can be separated into several (overlapping) categories. These are:

(a) Disturbed-ground specialists or 'pioneers' — mostly some small money spiders such as *Erigone* spp. and *Oedothorax* spp., which thrive in the uniform structured grassland typical of lawns and recreation grounds, but which seem to be generally at a disadvantage when the vegetation becomes more structurally diverse — with longer grass, tussocks, anthills, etc.

(b) Grassland generalists — *Pachygnatha degeeri, Centromerus bicolor* and several wolf spiders (Lycosidae), which can survive in small numbers in mown grassland but which increase greatly in numbers as structural diversity increases.

(c) Grassland specialists — *Argenna subnigra, Ozyptila* spp. *Euophrys frontalis* and others, characteristic of structurally diverse grassland. (Some grassland specialists may be particularly associated with other features such as tussocks or rabbit-holes).

(d) Spiders associated with ants, occurring only where there are anthills — *Zelotes latreillei, Phrurolithus festivus, Micaria pulicaria* and others.

The first three categories at least are not exclusive. Spiders of group (a) occur often in large numbers on disturbed or newly created sites but are only found in very small numbers (if at all) on well-established unmown (and therefore structurally diverse) grassland. On areas of old, unaltered grassland of complex structure the balance of groups (b) and (c) favours the grassland specialists, but in most places group (c) spiders occur in smaller numbers.

As the graphs in Figure 2 show, the composition of the catch changed considerably between 2005 and 2012. The high total (952) in the first year (2005) was mainly due to the large numbers of five pioneer species of money spider (two species of *Erigone*, two species of *Oedothorax* and *Milleriana inerrans*) which together made up 590 (62 per cent) of the total catch — indeed more than half the total catch was a single species, *Erigone dentipalpis*. This would be a typical proportion for a garden lawn, which the area resembled at the start of this study, but not for more 'settled' grassland growing taller and being less uniform; in a list of the most widespread grassland spiders in London, *E. dentipalpis* is only No. 13 (Milner 2000). By contrast, the number of wolf spiders (group b) was low: 132 or just 14 per cent of the total.

In the first three years the most spectacular change was the reduction in the numbers of the five pioneers. By 2008 they had dropped from 62 per cent of the catch to less than one per cent; by contrast the wolf spiders increased, rather more slowly, from the low base of 14 per cent of the catch to over 50 per cent in both 2010 and 2011 although numbers dropped in 2012. These figures both for disturbed and heavily mown grass in 2005, and for rather more settled unmown rough grass in 2012, compare with similar habitats elsewhere in London (Milner 2000).

FIGURE 3. Damage caused by mowing in October 2011, with cut grass left in drifts, 25 October 2011.

FIGURE 4. Close-up of the vegetation dominated by grasses, including *Dactylis glomerata* that has developed since relaxation of mowing in 2004, 14 June 2013. Pitfall trap site is approximately in the centre.

FIGURE 5. View of meadow, Area A, looking towards railway bridge on Grove Road, August 2011.

FIGURE 6. Corporate vandalism in a London Park, 25 September 2013. This truck has been driven onto Clinton Road Meadow without reference to the park management. It is actually a Railway subcontractor's vehicle; the operatives are cutting branches on trackside trees for Network Rail (outside the park boundary), but when the writer spoke to the team they were apparently ignorant about the ownership or nature of the land they were parked on, or the damage they were doing; trampling vegetation, flattening anthills etc. They removed the vehicle immediately and asked how they should get permission and whom to approach in the London Borough of Tower Hamlets!

The incident is typical of the lack of concern for the natural environment by many commercial entities who are inadequately supervised when subcontracted to public bodies and large corporate concerns.

FIGURE 7. Damage caused by mowing in October 2011. Foreground shows destruction of a single anthill created by meadow ant *Lasius flavus*. Undamaged grass in background.

Observed variations in the figures for grassland generalists like *P. degeeri* and *C. bicolor* (Nos 2 and 5 among the most widespread grassland spiders in London (Milner 2000)) can also be explained ecologically. Numbers of *P. degeeri* nearly trebled between 2005 and 2009, but fell away after that; a possible explanation is that the species was replaced by more wolf spiders which appear to occupy a similar niche. *C. bicolor* numbers increased from 2005 to a peak in 2009, but have since remained more or less stable; this winter-active species was probably unaffected by the damp summer in 2012. Ant-associated species, common crab spiders, grassland specialists, and the large winter-active long-grass species *Stemonyphantes lineatus,* have all increased substantially during the study period, in most cases from a very low base or even absence before the mowing was relaxed. These increases can be interpreted as evidence of a gradual improvement in the habitat for all these species.

A more-detailed examination of the figures for wolf spiders suggest a possible succession. *P. palustris* is known to be a disturbed-ground species (Milner 2000: 138), and while in 2005 it was the most abundant wolf spider present, its numbers fell rapidly when mowing was reduced, while *P. pullata* and later *Alopecosa pulverulenta* (both grassland species that can tolerate some disturbance) continued to increase their numbers peaking in successive years: 2009 and 2010 respectively. The most abundant species in each year were as follows: 2005 *P. palustris*, 2006, 2007, 2009 *P. pullata*, and 2008, 2010, 2011, 2012 *Alopecosa pulverulenta*. The writer's prediction would be that, assuming a reasonable summer in 2013 wolf spider numbers will increase from 2012 numbers, and *A. pulverulenta* will remain the most abundant wolf spider present; its numbers may well exceed the peak of 2010.

In 2012, following the mowing damage noted earlier, there was a return of small numbers of two pioneers (*Erigone* spp.) which together made up 5 per cent of the catch, but it is not clear how much the wolf spiders were affected. It is expected that as the small patches of bare ground are colonized by grasses and other plants, the numbers of pioneers will drop once again as the sward recovers. Much of the meadow is now a rapidly maturing piece of semi-natural neutral grassland with anthills, where pioneer spiders would not normally be found except as occasional individuals.

The first 'ant-associated' spider was trapped in 2005 — a single specimen of the ant-mimic *Phrurolithus festivus*; subsequently several other species associated with ants were found: *Zelotes latreillei, Drassylus pusillus* and *Micaria pulicaria.* Some grassland specialists (*Hypsosinga pygmaea, Argenna subnigra,* etc.) also appeared in small numbers in the later years of the study contributing to the increased species richness.

Spider biomass has increased during the study period reaching a peak in 2009, although it has dipped somewhat since, especially in 2012, by which time the total spider biomass had approximately doubled. Perhaps the most significant line of data is that labelled 'Mean biomass per individual spider', or what I will call the 'unit biomass'. This is the figure produced by dividing the biomass by the total number of spiders for each year. The unit biomass shows a substantial rise and even allowing for a poor year in 2012 it is well over double that for 2005 in each of the last five years. What this means is that overall the spider fauna, dominated by small pioneers in 2005, has matured to a more normal grassland fauna with a unit biomass fluctuating around two to three times what it was seven years earlier; smaller pioneer spiders have been replaced by larger grassland ones. This trend may continue further in the coming years; while some small grassland spiders can be expected to thrive, the fauna will be increasingly dominated, in biomass terms, by larger spiders, mainly wolf spiders.

The ramifications of the changes observed are not fully known, but other groups of organisms may certainly have benefitted. Subjective observations suggest that botanically the meadow's diversity has increased, and obviously meadow ants which now thrive were not present before; they in turn have attracted some spiders known to be associated with ants and anthills. The increased biomass of spiders, and the replacement of small pioneer species by larger wolf spiders means the meadow is likely to be more attractive to small birds such as robin, house-sparrow, dunnock and chaffinch, all of which often forage for ground-living prey. The reduced disturbance means that wrens may be attracted further out from adjacent bushes than they would normally venture — a large *Alopecosa pulverulenta* spider being a pretty good beakful for a tiny bird like a wren — while the development of anthills attracts green woodpeckers. Many birds bring in seeds of other plants in their droppings, although the natural development of the meadow may well be for conversion to secondary woodland. If this is to be prevented young tree seedlings (such as oak and hawthorn) will need to be removed by human intervention in the absence of grazing animals such as deer or rabbits.

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TABLE 1. Results of spider trapping at Clinton Road Meadow, 2005–2012.
(NB: biomass calculated by square of body length, all 'others' given biomass of 1)

Spiders	2005	2006	2007	2008	2009	2010	2011	2012	length (L)	biomass (L^2)
5 'Pioneers'										
O. fuscus	9	1	0	0	0	0	0	0	1	1
O. retusus	2	0	0	0	0	0	0	0	1	1
E. dentipalpis	529	45	12	2	0	3	4*	25	1	1
E. atra	20	1	2	2	0	2	0	2	1	1
M. inerrans	30	23	4	0	0	0	0	0	1	1
Totals	**590**	**70**	**18**	**4**	**0**	**5**	**4**	**27**		
Wolf spiders (Lycosidae)										
P. palustris	61	14	10	11	12	4	4	4	2	4
P. pullata	51	57	134	63	205	61	103	71	2	4
P. prativaga	10	20	19	5	53	17	42	2	2	4
A. pulverulenta	9	15	49	96	102	222	163	109	3	9
Other lycosids	1	0	0	0	2	0	5	1	2	4
Totals	**132**	**106**	**212**	**175**	**374**	**304**	**317**	**187**		
Other species										
Pachygnatha degeeri	101	166	222	274	275	123	74	97	2	4
Centromerita bicolor	14	23	76	36	77	66	71	68	2	4

Ant-associated spp. (*Zelotes* etc.)	1	6	0	7	3	9	15	6	1*	1
Xysticus spp. (2)	7	2	5	15	6	10	10	20	2	4
Grassland specialists: salticids, *Ozyptila*, *Argenna*	0	0	3	0	3	3	8	6	1	1
Stemonyphantes lineatus	0	0	7	9	18	23	16	3	3	9
Miscellaneous spp.	107	160	172	110	85	31	54	126		1
Totals	**230**	**368**	**485**	**451**	**467**	**265**	**248**	**326**		
Total spiders	**952**	**544**	**715**	**630**	**841**	**574**	**569**	**540**		
Species richness										
Total spp.	31	28	34	27	28	27	33	35		
Pioneer spp. (5 spp.)	5	4	3	2	0	2	1	2		
Non-pioneer spp.	26	24	31	25	28	25	32	33		
BIOMASS estimates										
5 pioneers	590	70	18	4	0	5	4	27		
All lycosids	573	499	1,093	1,180	2,006	2,326	2,083	1,293		
Other species	596	730	1,450	1,598	1,500	1,046	837	905		
Totals	**1,759**	**1,299**	**2,561**	**2,782**	**3,506**	**3,377**	**2,924**	**2,225**		
Mean biomass per individual spider	1.8477	2.388	3.58	4.42	4.17	5.88	5.139	4.12		

TABLE 2. Spiders recorded at Clinton Road Meadow.
Columns: **1**. National Conservation Status
2. Name of spider
3. No. of sites recorded in county of London
4. Date of first record from Clinton Road Meadow

1	2	3	4
DYSDERIDAE			
Comm	*Dysdera crocata*	17	15.v.2007
MIMETIDAE			
Comm	*Ero furcata*	22	16.x.2007
THERIDIIDAE			
Comm	*Neottiura bimaculatum*	21	10.ix.2007
Loc	*Enoplognatha latimana*	8	15.viii.2012
Loc	*Enoplognatha thoracica*	23	20.x.2005
LINYPHIIDAE			
Comm	*Walckenaeria acuminata*	29	17.viii.2007
Comm	*Walckenaeria antica*	31	18.vii.2005
Loc	*Walckenaeria atrotibialis*	17	17.viii.2007
Loc	*Dicymbium brevisetosum*	27	14.iii.2005
Comm	*Oedothorax fuscus*	33	14.iii.2005
Comm	*Oedothorax retusus*	24	15.iv.2005
Loc	*Pelecopsis parallela*	15	14.iii.2005
Loc	*Cnephalocotes obscurus*	17	14.vi.2005
Loc	*Tapinocyba praecox*	14	13.ii.2007
Loc	*Microctenonyx subitaneus*	1	15.i.2009
Comm	*Monocephalus fuscipes*	24	15.iii.2010
Comm	*Gongylidiellum vivum*	30	15.vi.2006
Comm	*Micrargus herbigradus* s.s.	29	15.iv.2007
Loc	*Micrargus subaequalis*	21	15.vi.2006
Comm	*Erigonella hiemalis*	17	16.iii.2009
Comm	*Savignia frontata*	13	14.iii.2005
Comm	*Diplocephalus latifrons*	24	15.iv.2008
Comm	*Diplocephalus picinus*	29	15.v.2008
Loc	*Milleriana inerrans*	28	14.iii.2005
Comm	*Erigone dentipalpis*	52	14.iii.2005
Comm	*Erigone atra*	49	14.iii.2005
Nat.	*Erigone aletris*	5	15.iv.2005
Comm	*Meioneta rurestris*	31	14.iii.2005
Loc	*Meioneta beata*	20	20.v.2005
Comm	*Microneta viaria*	36	15.iv.2005
Comm	*Centromerita bicolor*	27	14.iii.2005
Comm	*Centromerita concinna*	15	6.i.2007
Comm	*Bathyphantes gracilis*	42	14.vi.2005
Comm	*Bathyphantes parvulus*	20	14.vi.2005
Comm	*Diplostyla concolor*	39	13.viii.2006
Comm	*Stemonyphantes lineatus*	31	16.xi.2007
Comm	*Lepthyphantes tenuis*	59	15.iv.2005
Comm	*Lepthyphantes zimmermanni*	37	15.vi.2006
Comm	*Lepthyphantes mengei*	19	16.xi.2007

1	2	3	4
Comm	*Lepthyphantes flavipes*	40	17.x.2005
Comm	*Lepthyphantes ericaeus*	28	8.xii.2006
Comm	*Microlinyphia pusilla*	10	15.i.2010
Tetragnathidae			
Comm	*Pachygnatha clercki*	26	15.ii.2006
Comm	*Pachygnatha degeeri*	47	14.iii.2005
Araneidae			
Comm	*Araneus diadematus*	30	13.x.2012
Loc	*Hypsosinga pygmaea*	10	15.iv.2008
Na	*Argiope bruennichi*	13	16.vii.2007
Lycosidae			
Comm	*Pardosa palustris*	25	20.v.2005
Comm	*Pardosa pullata*	41	20.v.2005
Comm	*Pardosa prativaga*	27	20.v.2005
Comm	*Pardosa nigriceps*	6	15.iv.2007
Comm	*Alopecosa pulverulenta*	33	20.v.2005
Comm	*Trochosa terricola*	25	15.vii.2009
Loc	*Pirata uliginosus*	8	15.vi.2011
Pisauridae			
Comm	*Pisaura mirabilis*	33	15.v.2009
Hahniidae			
Loc	*Hahnia nava*	18	20.v.2005
Dictynidae			
Loc	*Argenna subnigra*	3	14.vi.2007
Liocranidae			
Comm	*Phrurolithus festivus*	18	14.vi.2005
Clubionidae			
Comm	*Clubiona reclusa*	24	15.v.2011
Gnaphosidae			
Loc	*Zelotes latreillei*	15	15.v.2008
Loc	*Drassyllus pusillus*	8	20.vii.2008
Comm	*Micaria pulicaria*	20	13.viii.2006
Thomisidae			
Comm	*Xysticus cristatus*	48	20.v.2005
Loc	*Xysticus kochi*	20	20.v.2005
Loc	*Ozyptila sanctuaria*	8	15.i.2009
Loc	*Ozyptila simplex*	9	14.vi.2007
Salticidae			
Comm	*Heliophanus cupreus*	4	15.iv.2012
Comm	*Heliophanus flavipes*	10	15.vi.2011
—	*Macaroeris nidicolens*	1	15.iv.2012
Na	*Bianor aurocinctus*	4	18.vii.2005
Comm	*Euophrys frontalis*	25	15.x.2009

TABLE 3. Plants recorded at Clinton Road Meadow.
Identifications by D. Bevan.

APIACEAE	
Daucus carota	Wild carrot
ASTERACEAE	
Achillea millefolium	Yarrow
Cichorium intybus	Chicory
Cirsium arvense	Creeping thistle
Crepis vesicaria ssp. *taraxicifolia*	Beaked hawk's beard
Helminthotheca echioides	Prickly oxtongue
Leontodon sp.	Hawkbit
Matricaria chamomilla	Scented mayweed
Picris hieracioides	Hawkweed oxtongue
Scorzoneroides autumnalis	Autumn hawkbit
Senecio jacobaea	Common ragwort
Sonchus oleraceus	Smooth sowthistle
BORAGINACEAE	
Symphytum × *uplandicum*	Russian comfrey
BRASSICACEAE	
Hirschfeldia incana	Hoary mustard
Lactuca serriola	Prickly lettuce
Lepidium draba	Hoary cress
CARYOPHYLLACEAE	
Cerastium fontanum	Common mouse-ear
Stellaria media	Chickweed
CONVOLVULACEAE	
Convolvulus arvensis	Field bindweed
FABACEAE	
Lotus corniculatus var. *sativus*	Bird's foot trefoil (fodder variety)
Medicago arabica	Spotted medick
Medicago sativa	Lucerne (alfalfa)
Trifolium dubium	Lesser hop trefoil
Vicia cracca	Tufted vetch
Vicia sativa ssp. *segatilis*	Common vetch
GERANIACEAE	
Geranium dissectum	Cut-leaved cranesbill
LAMIACEAE (LABIATAE)	
Lamium purpureum	Purple dead-nettle
LAMIACEAE	
Ballota nigra	Black hoarhound
PLANTAGINACEAE	
Plantago lanceolata	Ribwort plantain
POACEAE	
Agrostis stolonifera	Creeping bent
Alopecurus pratensis	Meadow foxtail
Arrhenatherum elatius	False oat-grass
Bromus hordeaceus	Soft brome
Anisantha (Bromus) sterilis	Barren brome grass

Dactylis glomerata	Cock's foot
Elytrigia repens	Couch grass
Festuca rubra	Red fescue
Holcus lanatus	Yorkshire fog
Hordeum murinum	Wall barley
Hordeum saculinum	Meadow barley
Phleum bertolonii	Smaller cat's tail
Phleum pratense	Timothy grass
Poa pratensis	Smooth meadow grass
Poa trivialis	Rough meadow grass
Trisetum flavescens	Yellow oat-grass
Ranunculaceae	
Ranunculus bulbosus	Bulbous buttercup
Rosaceae	
Geum urbanum	Wood avens
Potentilla reptans	Creeping cinquefoil
Poterium sanguisorba ssp. *balearicum*	Fodder burnet
Rubiaceae	
Galium aparine	Cleavers

Book review

Smaller moths of Surrey. R. M. Palmer, J. Porter and G. A. Collins. 543 pp., 32 coloured plates, hardbound, ISBN 978 0 9556188 3 3. Surrey Wildlife Trust, 2012. £28 plus £5.70 UK postage and packaging, available from the publisher at School Lane, Pirbright, Woking, Surrey GU24 0JN; tel. 01483 795488, cheques payable to Surrey Wildlife Trust; or on line at *www.surreywildlifegifts.org.uk/collections/atlas-series*

This is the thirteenth in this series of excellent publications from the Surrey Wildlife Trust, each covering a different taxonomic area (all but one of which are invertebrate groups). The larger moths were covered as long ago as 1997 and so the present work, completing the picture, is much welcomed. The three authors are among our foremost moth experts and so this reviewer expects that the work will attain the same high standard that has been exhibited throughout the series; he has not been disappointed.

The work follows the standard layout for the series; sequence and nomenclature appear to adhere to the current British checklist. The entry for each species includes a brief summary of status in the county followed by a paragraph of text and accompanied by a distribution map that is based on tetrads (2 km × 2 km map squares). The maps rightly make no distinction between reports of adults and of larvae and map only those sightings made since 1986; this means that they are not cluttered with different symbols and could be printed in monochrome rather than colour. Species not recorded since 1986 are, consequently, not mapped.

A Table lists the UK Biodiversity Action Plan Priority Species recorded in Surrey; these number eleven (an additional two were recorded in error), of which five are reported as extinct in the county and three are known from only a single site. Given that the report of one of the remaining three requires confirmation, that leaves just two that are known from multiple sites. It is tempting to assume that this must surely reflect the modern encroachment of south-west London into what is one of the most entomologically diverse counties of Britain, but examination of each of the species accounts does not provide any evidence to support this. Indeed, of the two species that are recorded from more than one site, *Nemophora fasciella* is probably benefiting from urbanization, which evidently creates habitat suitable for its foodplant (black horehound *Ballota nigra*) to thrive.

The level of coverage is presented via two coloured maps in Plate 2. These, wisely, separate the moths into the more frequently reported leaf-mining species and 'the rest'; there is at least one micro record from all except three map tetrads. However, considering only the non-miners, it is evident that at least 90 per cent of the map tetrads in the county have records of less than fifty species, with only around 4 per cent recording more than 200 species. Given that the Preface informs that 'more than 1,130 species of micromoth have been recorded in Surrey', it is implicit that the vast majority are either extremely local or extremely under-recorded. However, this is not to be interpreted as criticism. Indeed, the cynic in me knows well that one of the best ways to stimulate the submission of data is to publish works recording its absence; it also stimulates people to go and look!

A single section of colour plates occupies thirty-two pages and depicts a good cross section of moths, including larvae and leaf mines as well as adults. The work is dedicated to John Langmaid, who will be known, at least by name, to anyone with more than just a passing interest in British micro-moths.

Criticism of this book is difficult. There are no chapters dedicated to habitat, and conservation gets only the briefest of mentions — but then that is a consequence of the overall format of books in this series and so is scarcely the fault of the authors. All in all, another very useful addition to the biodiversity inventory of Surrey and, as I have said in reviews of earlier volumes in this series, an inspiration to others in different counties.

COLIN W. PLANT

London butterfly monitoring report for 2012

L. R. WILLIAMS

34 Christchurch Avenue, Kenton, Harrow, Middlesex HA3 8NJ

Abstract

Data from twenty-six sites in London, monitored using the transect walks method, were used to calculate collated indices for 2012 and to enable comparisons with previous years. Species accounts were supplemented by records from other sites, surveys and observations.

Introduction

Monitoring of butterflies provides information on changes in the abundance of species between years. Comparison is possible for individual sites; and data can be collated to provide indices of abundance for a region or particular habitats. Results are presented in this paper for London, defined here as the Greater London area. In London monitoring commenced in 1978 and this paper presents an update for 2012. Other records of butterflies from London and from the wider London Natural History Society (LNHS) recording area are noted.

Methods

Butterflies were monitored along transects by use of the standard method of the UK Butterfly Monitoring Scheme. This is described at www.ukbms.org but see also Pollard and Yates (1993) and Crawford (1991) for an introduction to the use of collated indices in wildlife monitoring; and Williams (2000) for details on the application of the method in London. Each transect comprises a set route, walked weekly between April and September inclusive, and within a standard range of weather conditions conducive to butterfly flight. Counts were made of the number of adult butterflies observed to provide a total for each species for the year at each transect.

Transects should preferably be walked once in each of the weeks from April to September. Providing that a transect had good coverage, estimates can be made for weeks missed due to poor weather or the unavailability of the recorders. However, if too few weeks were walked, it was difficult to calculate estimates and the transect was not included in the indices for that year. To contribute to the indices, data from each transect must be available for at least two years, though these do not need to be consecutive.

Note that neither the original site counts nor the collated indices are absolute counts of the population but indices of abundance for each species. Estimates of the relative changes in the populations of each species from year to year are given by the difference in the indices. For example, a species with an index of 50 in one year and 25 in the following year would have had approximately half the adult population in the second year as compared with

the first year. Indices have been rounded to the nearest whole number and were generally set at 100 in 1990 or the first year of record of a species: for a technical discussion see Crawford (1991). Reliability of indices increases with the number of transects. In the earlier years there were relatively few transects, for example one transect was walked in 1978, two in 1986, three in 1988 and eight in 1990. Reliability of the indices may be lower for species with low counts and/or local distribution in London. The 'Total count on transects' provides an indication of the size of the count from which the analysis was made in 2012 using the data from the transects included in the index for that year. Those figures included the estimated counts for missing weeks; but not data or estimates for transects that were not walked or that had insufficient data in 2012.

While the butterfly transect walks are undertaken during weather above a threshold so that butterflies will be in flight and therefore visible, the weather during 2012 resulted in fewer survey days than in a typical year. Dry weather and a drought had continued into the first few, winter, months of 2012, but from April onwards, when the butterfly transects commenced, England experienced some of the wettest periods on record. The number of weeks 'missed' due to poor weather at transect sites was higher than usual. At eight sites the number of weeks missed was too high to include the data available in the indices. For those sites, the actual data were substituted by the 'weak index' data computed by the Transect Walker software. These sites were Mitcham Common route A, Mitcham Common route B, Cranford Park, Gunnersbury Triangle, Hounslow Heath B, South Norwood Country Park, Bedfont Lakes, and Lake Farm Country Park.

Transects that contributed data in 2012, the years for which data were available and the Borough in which the transect was located were: **Hampstead Heath** (Camden) 1978–2012, **Fryent Country Park** (Brent) (Figures 1–3) 1986–2012, **Beane Hill** (Brent) 1988–2012, three transects managed by the Corporation of London (located in the London Borough of Croydon): **Farthing Downs** 1990–2011, **Kenley Common** 1990–2009, 2012, **Riddlesdown** 1990–2012; **Mitcham Common 'route A'** (Merton) 1994–2001, 2003–2012, **Mitcham Common 'route B'** (Merton) 1995–2012, **Wildfowl and Wetlands Trust Wetland Centre at Barn Elms** (Richmond upon Thames) 1996–2012, **Railway Fields** (Haringey) 1997–2012, **Hutchinson's Bank Nature Reserve** (Croydon) 1997–2012, **Cranford Park** (Hounslow) 1997–2005, 2012, **South Norwood Country Park** (Croydon/Bromley) 1998–2012, **Tower Hamlets Cemetery Park** (Tower Hamlets) 1999–2012, **Gunnersbury Triangle** (Hounslow) 1999–2012, **Brent Reservoir** (Barnet/Brent) 2000–2012, **Regent's Canal towpath from Mile End Road to Mare Street** (Tower Hamlets/Hackney) 2001–2012, **Riddlesdown Quarry** (Croydon) 2001–2005, 2008–2012, **Kenwood Estate** (Camden) 2005–2012, **Horsenden Hill East** (Ealing) 2005–2012, **Horsenden Hill West** (Ealing) 2005–2012, **Perivale Wood** (Ealing) 2005–2012, **Farthing Downs New Hill** (Croydon) 2005–2006, 2008–2012, **Hounslow Heath B** (Hounslow) 2010–2012; **Bedfont Lakes** (Hounslow) 2011–2012; and **Lake Farm Country Park** (Hillingdon) 2011–2012. A transect at **Parkland Walk South** (Haringey) was walked for the first year and will be included in the indices when a second year of data is available. Recorders for 2012 are listed in the Acknowledgements. For some sites, the indices have been updated with data from earlier years that were not available previously.

Records from LNHS and other observations have been included in the species accounts where appropriate. Transects beyond Greater London but within the LNHS area are not included in these collated indices and reference should be made to the respective county data and reports produced by Butterfly Conservation, for example, Wood (2013). However the species accounts below make reference to the wider area where appropriate.

The London transects contribute towards the national indices of the UK Butterfly Monitoring Scheme, and for results up to 2011 refer to Botham et al. (2013). Records also contribute towards the data held by Greenspace Information for Greater London (GiGL).

Results

The order and nomenclature of the species accounts follow Asher et al. (2001). The accounts are based on the collated indices that commenced in 1978, and which for the years 2002 to 2012 are presented in Table 1. Some year-to-year variation is to be expected, so the comments are focused on the more pronounced changes and on longer-term trends.

Small skipper *Thymelicus sylvestris* and Essex skipper *Thymelicus lineola*

Small and Essex skippers are generally counted together by transect walkers due to the difficulty of separately identifying the two species while they are in flight. Both are dependent on rough grassland habitat. The 2012 index was the lowest since butterfly monitoring commenced in London in 1978. Within this period there is evidence of reduced numbers at many of the longer running transects. At seventeen transects, recorders identified some of the individuals to species; and while the small skipper was present at all of those sites, the Essex skipper was identified at six. Of those 146 skippers, 77 per cent (113) were small skippers and 23 per cent (33) were Essex skippers. The decline of these species in London in 2012 was reflected by large declines in Middlesex and Hertfordshire (Wood 2013) and longer-term by national trends to 2011 (Botham et al. 2013). Total count on transects: 844.

Large skipper *Ochlodes sylvanus*

In London the large skipper was associated with rough grassland and scrub. The index was one of the lowest since monitoring commenced in London in 1978. Total count on transects: 233.

Dingy skipper *Erynnis tages*

The typical habitat of the dingy skipper is short grassland containing the larval food plants, with some bare patches and taller vegetation to provide shelter and roosting areas (Asher et al. 2001). In London the species is effectively confined to chalk grassland sites on the southern edge of the area such as at Hutchinson's Bank Nature Reserve and Riddlesdown Quarry. Total count on transects: 57.

Grizzled skipper *Pyrgus malvae* (Frontispiece)

Habitat for the grizzled skipper is unimproved grasslands containing spring nectar plants and the larval food-plants, preferably with bare patches and taller vegetation (Asher et al. 2001). In London the species is effectively confined to a few chalk grassland sites on the southern edge of the area: in 2012 the transect records were from two sites. Total count on transects: 8.

FIGURE 1. Hay meadow wildflowers and grasses; habitat for the meadow brown. Fryent Country Park in June prior to harvesting. *Photo: Leslie Williams*

FIGURE 2. Cutting a meadow to make hay in early August at Fryent Country Park. Cutting, and harvesting the cut hay, maintains the hay meadow habitat.
Photo: Leslie Williams

FIGURE 3. Hay bales at harvest in July at Fryent Country Park. The arch of Wembley Stadium is in the distance. *Photo: Leslie Williams*

TABLE 1. Collated indices for butterfly species in London, 2002–2012. Indices have been rounded to the nearest whole number and have usually been set at 100 in 1990 or the first year of record, though indices may be set at 100 in other years or at a different figure where this aids interpretation. A blank indicates that the species had not yet been recorded on any transect in London. A zero indicates that a species was not observed on transects in that year but had previously been observed on a transect in London.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Small and Essex skippers	72	72	75	78	73	60	60	63	33	39	30
Large skipper	59	84	56	61	48	44	27	63	52	69	31
Dingy skipper	70	104	69	56	26	14	15	30	39	80	63
Grizzled skipper	48	41	80	20	26	44	65	114	29	110	33
Clouded yellow	75	121	108	0	554	24	88	300	0	0	0
Brimstone	86	74	105	102	95	68	70	130	82	119	57
Large white	173	113	144	159	143	71	117	305	105	86	50
Small white	148	168	245	199	179	182	147	222	162	253	133
Green-veined white	94	73	92	64	56	49	47	93	49	91	40
Orange tip	78	42	62	73	49	33	38	75	77	118	75
Green hairstreak	209	83	119	73	45	105	79	85	63	246	55
Purple hairstreak	307	185	275	466	339	319	419	484	533	398	104
White-letter hairstreak	11	12	8	62	99	22	27	73	67	23	12
Small copper	6	57	50	20	55	47	31	48	47	41	27
Small blue	217	45	68	137	485	287	195	365	1,323	3,204	378
Brown argus	14	26	26	11	26	19	12	17	37	57	5
Common blue	50	144	63	53	115	33	41	90	129	55	22
Chalkhill blue	39	39	90	29	129	10	3	10	8	32	73
Holly blue	43	43	64	73	41	72	63	24	43	56	41
White admiral	0	0	100	0	0	0	100	0	100	300	0
Purple emperor				100	0	0	0	0	0	0	0
Red admiral	209	421	131	161	371	386	140	142	150	256	269
Painted lady	71	378	36	3	229	36	4	1,006	18	3	13
Small tortoiseshell	25	66	143	52	26	12	5	10	24	32	8
Large tortoiseshell								100	0	0	0
Peacock	633	380	579	500	308	391	308	837	616	278	177
Comma	134	205	151	125	229	116	117	306	139	99	73
Dark green fritillary	11	91	9	4	0	0	0	11	7	22	15
Silver-washed fritillary	0	0	0	125	500	0	0	125	758	867	0
Glanville fritillary										100	214
Speckled wood	202	229	139	147	130	121	187	235	129	164	120
Marbled white	17	34	24	12	35	32	52	57	34	45	60
Gatekeeper	127	161	204	243	195	154	149	184	165	168	180
Meadow brown	67	137	113	150	131	77	84	80	50	75	120
Ringlet	288	379	220	164	202	138	255	314	268	264	273
Small heath	1	10	9	12	10	12	8	10	14	46	29

BRIMSTONE *Gonepteryx rhamni*

The index was the lowest for London since comparable indices for the species commenced in 1990. The brimstone remained widespread and there were records from most of the sites within urban London where it had established since the early 1990s. The planting and subsequent growth of the main larval foodplants, particularly alder buckthorn *Frangula alnus,* and on drier soils, common buckthorn *Rhamnus cathartica*, has facilitated the establishment of new populations. Brimstones were recorded flying in London in each of the months of January to September 2012. Total count on transects: 378.

LARGE WHITE *Pieris brassicae*

The large white ranges widely but is associated with locations where the larval food plants occur, and particularly in agricultural areas where *Brassica* field crops are grown, and in urban areas with gardens and allotments. For London, the index was the lowest since 1996. Total count on transects: 350.

SMALL WHITE *Pieris rapae*

Associated with *Brassica* plants, the small white is noted for laying eggs on crops and garden plants. Recorded on all transects, though some transect records appear to include counts for the green-veined white. The index was the lowest in London since 2001. As in 2011, the species appeared relatively abundant at sites located within urban London as compared with outer London. Total count on transects: 1,548.

GREEN-VEINED WHITE *Pieris napi*

For London, the index for 2012 was the lowest since the series commenced for the green-veined white in 1984. The green-veined white occurs particularly in damp grassland, and alongside hedgerows, woodland, ditches and water where wild crucifer food plants grow. Though widespread, the green-veined white appeared to be relatively more abundant in green spaces within the urban areas. Total count on transects: 931.

ORANGE TIP *Anthocharis cardamines*

A species of damp meadows, hedgerows, woodlands, roadsides and waterside habitats where crucifer food plants occur, in particular cuckooflower *Cardamine pratensis* and garlic mustard *Alliaria petiolata*. Orange tips were widespread in London, and though the index was lower than in 2011, it was similar to that in 2009 and 2010. Total count on transects: 499.

GREEN HAIRSTREAK *Callophrys rubi*

The green hairstreak is a species of unimproved grasslands with shrubs and scrub. Records were from three transects in south London; but also from the Wildfowl & Wetlands Trust Wetland Centre at Barn Elms. The record on 28 May 2012 by Richard Bullock was the first of a green hairstreak on the transect at Barn Elms and followed records by Laurence Arnold on 12 May 2012 and Martin Honey on 26 May 2012 from elsewhere on the site. Two were recorded at Braeburn Park, Crayford, during the LNHS visit on 26 May 2012. Total count on transects: 9.

PURPLE HAIRSTREAK *Neozephyrus quercus*

Colonies of the purple hairstreak are associated with oaks *Quercus* spp. Purple hairstreaks generally fly during the evening; and compared with other species are possibly under-recorded on transects which are walked during the day. The index was the lowest since 1996. Purple hairstreaks were also recorded at several sites in the London Borough of Bexley, from Bookham Common and at Ruislip Woods. Total count on transects: 32.

WHITE-LETTER HAIRSTREAK *Satyrium w-album* (Figure 4)

White-letter hairstreaks use elms *Ulmus* spp. for breeding, and with the loss of mature elm trees in the 1970s, the butterfly is now associated in London with younger elm trees that have grown from suckers in hedgerows and woodland edges. Small sample sizes limit the reliance that can be placed on the index, though 2012 was the lowest for some years. There were transect records from the Brent Reservoir, from both of the Horsenden Hill transects and from Tower Hamlets Cemetery Park. Total count on transects: 5.

SMALL COPPER *Lycaena phlaeas*

Dry, unimproved grassland is the main habitat for the small copper, particularly where the main larval foodplants, common sorrel *Rumex acetosa* and sheep's sorrel *R. acetosella*, occur. Distribution and abundance have declined in London since the 1990s, while the index for 2012 was the lowest since 2005. Total count on transects: 161.

LONG-TAILED BLUE *Lampides boeticus* (Frontispiece)

John Archer recorded a single male long-tailed blue from the East India Dock Basin (TQ391808) on 11 August 2012. This butterfly was assumed to be a migrant from Europe. Plant (1987) noted that there had been sixteen records of this species in the LNHS recording area to 1987, of which five were in 1945. Total count on transects: 0.

SMALL BLUE *Cupido minimus*

The small blue is dependent upon the sole food plant, kidney vetch *Anthyllis vulneraria*; and in London is effectively confined to chalk grassland sites on the southern edge of the area. Peter Townsend reported several small blue butterflies at Warren Farm, Cheam, just beyond the Greater London boundary during the LNHS visit on 10 June 2012, and photographed by Jovita Kaunang (*LNHS Newsletter* 226, August 2012: 25–26). Total count on transects: 33.

BROWN ARGUS *Aricia agestis*

While calcareous grassland is considered to be the typical habitat, the brown argus also occurs on other dry grasslands. In 2012 the brown argus was recorded on only four transects; three calcareous grassland sites and from Bedfont Lakes, but also away from the transect at Horsenden Hill. The index was relatively low compared with the years of the past decade. In the wider LNHS recording area there were records from Walton Reservoir. Total count on transects: 17.

COMMON BLUE *Polyommatus icarus*

The common blue is a species of grassland habitats and the main food plant is common bird's-foot trefoil *Lotus corniculatus*, though some other legume

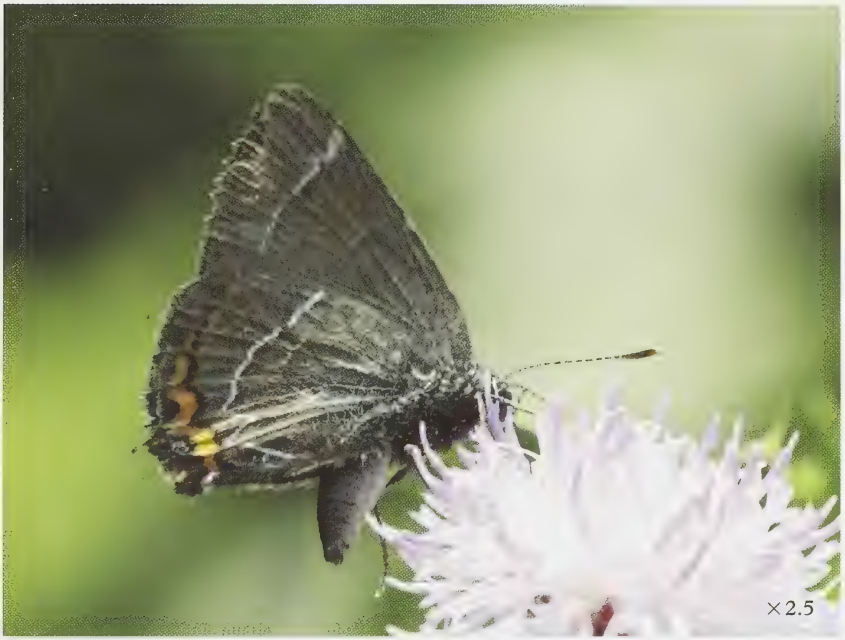

FIGURE 4. White-letter hairstreak at Horsenden Hill in July. *Photo: David Howdon*

FIGURE 5. Larva of small tortoiseshell at Perivale Wood in June. *Photo: David Howdon*

species are also used. The index was the lowest for London for all years from 1989 when comparable indices for this species commenced. Total count on transects: 311.

Chalkhill blue *Polyommatus coridon*

Calcareous grassland with the food plant, horseshoe vetch *Hippocrepis comosa* is the habitat of the chalkhill blue. Chalkhill blues were recorded at four transects on the southern edge of London in 2012; while the index increased on that of 2011 making for the best year since 2006. Total count on transects: 52.

Holly blue *Celastrina argiolus*

The holly blue is a widespread species dependent upon the presence of the larval food plants, particularly ivy and holly. As such it is the blue butterfly that can best adapt to urban areas, and in London appeared more a butterfly of open woodland and green spaces in urban London than at sites in areas of countryside. The holly blue was also noticeable at the new Parkland Walk South transect in Haringey. Total count on transects: 346.

White admiral *Limenitis camilla*

The white admiral is a butterfly of woodland and uses honeysuckle *Lonicera periclymenum* as the food plant. The one recorded on a transect was at Hutchinson's Bank Nature Reserve. Elsewhere, two white admirals were recorded by Martin Smith at Copse Wood, Ruislip on 22 July 2012. Beyond Greater London, four were recorded from Black Park on 25 July 2012. Total count on transects: 1.

Purple emperor *Apatura iris*

The habitat of the purple emperor is broad-leaved woodland where goat willow *Salix caprea* or grey willow *S. cinerea* occur, and it prefers larger woodlands or a landscape with numerous smaller woods and scrub. While none were recorded on London transects in 2012, it was recorded from north Enfield (Wood 2013) and from Ruislip Woods by David Howdon. Beyond Greater London but within the LNHS recording area, there were records from south-east Hertfordshire (Wood 2013). Total count on transects: 0.

Red admiral *Vanessa atalanta*

The red admiral is a migratory species from Continental Europe and North Africa, but may then breed in Britain to produce a summer generation, with some remaining to overwinter as adults. In spring females lay eggs on nettles, the young butterflies from which emerge in about July. In London the index was slightly higher than in 2011 and the highest since 2007. Overwintering adults are occasionally observed in flight; and in 2012 there were London records in each of the months of January, February (in the wider LNHS area), and from March to November inclusive. Total count on transects: 277.

Painted lady *Vanessa cardui*

A migrant from North Africa, the painted lady may occur in any habitat and will seek thistles as nectar sources and as the larval food plant. Numbers fluctuate greatly from year to year, as can be seen from Table 1. There were also

two records from the vicinity of Bexley, one at Walton Reservoir, and one at Rainham Marshes. Total count on transects: 12.

SMALL TORTOISESHELL *Aglais urticae* (Figure 5)

The small tortoiseshell occurs in a range of habitats including urban areas, and will seek the common nettle *Urtica dioica* and the small nettle *U. urens* as larval food plants. In London populations declined from about 2000, and the 2012 index was probably the second lowest since transect monitoring commenced in London in 1978. The small tortoiseshell was recorded on less than half of the transects in 2012, though apparently more evident at transects in the south of London. Total count on transects: 35.

PEACOCK *Inachis io*

Woodland paths, hedgerows, and gardens are habitats for the peacock though they may occur in other habitats seeking nectar plants or the common nettle *Urtica dioica* for egg laying. This was the lowest index in London since 1990. Total count on transects: 248.

COMMA *Polygonia c-album*

The comma has a preference for hedgerows, woodland edges and gardens and may also be found elsewhere. Though the comma appears generally to have increased in London over recent decades, the 2012 index was the lowest since some years of the mid 1980s. Total count on transects: 234.

DARK GREEN FRITILLARY *Argynnis aglaja*

The dark green fritillary is a butterfly of grasslands, light scrub and other open habitats. Various species of violet *Viola* spp. are the larval food plants. Four were recorded at Hutchinson's Bank Nature Reserve. Total count on transects: 4.

GLANVILLE FRITILLARY *Melitaea cinxia*

The Glanville fritillary is a species for which the distribution had become restricted particularly to coastal landslips on the Isle of Wight and the Channel Islands. In London the species had recently established at one site, possibly through reintroduction. Numbers recorded on the transect increased compared with 2011. Total count on transects: 15.

SPECKLED WOOD *Pararge aegeria*

Typically found along paths and in glades in woodland or flying in partial shade, the larval food plants of the speckled wood are various grasses. Speckled woods can also be seen in small green spaces and gardens within urban London. Recorded on all transects. Total count on transects: 1,743.

MARBLED WHITE *Melanargia galathea*

The habitat of the marbled white is unimproved, rough grassland preferably containing red fescue *Festuca rubra*. In London, the marbled white was one of the few butterfly species with an increased index in 2012 compared with 2011. While the marbled white is more a species of the countryside, populations have established at some green spaces in urban London during recent years. These include the Brent Reservoir and Horsenden Hill. Records were also received from Ruislip Woods. Total count on transects: 567.

GATEKEEPER *Pyronia tithonus*

Two English names for this species, gatekeeper and hedge brown, aptly describe the typical habitat of hedgerows, woodland edges and paths, rough grassland and scrub. It is also established in green spaces within urban London. Total count on transects: 3,593.

MEADOW BROWN *Maniola jurtina*

The meadow brown prefers more-open areas than the hedge brown with rough grassland or hay meadows, the management of which is conducive to the growth of the larval grass food plants. Recorded on all transects in 2012, it was more a species of semi-natural green spaces than of urban areas. The index was higher than in 2011 and the highest since 2006. Total count on transects: 11,676.

RINGLET *Aphantopus hyperantus*

The ringlet is a species of rough grassland in and near to woodland. In London the distribution was primarily at chalk grassland sites on the southern edge of the area but was also recorded at green spaces within urban London including Mitcham Common, Cranford Park, the Brent Reservoir, South Norwood Country Park, Hounslow Heath, Horsenden Hill, Lake Farm Country Park, and away from the transect at Perivale Wood. Observations were also received from Trent Park, Enfield; Ruislip Woods, and from the Bexley area. Total count on transects: 894.

SMALL HEATH *Coenonympha pamphilus*

The small heath occurs in short, well-drained grasslands, where the larval food plants of fine-leaved grass species occur. Most transect records were from chalk grassland sites on the southern edge of London while it also occurred at some green spaces sites within urban London. Observations were also received from Trent Park, Enfield; Yeading Brook Meadows; Barnehurst Golf Course, near Bexley; and in the wider LNHS recording area from Walton Reservoir and Molesey gravel pits. Total count on transects: 659.

The following species were recorded in the wider LNHS area during 2012 but with no records from the Greater London area:

CLOUDED YELLOW *Colias croceus*

Singletons were recorded at Walton Reservoir (TQ122685) on 17 September 2012 and 12 October 2012 by Stephen Spooner.

SILVER-STUDDED BLUE *Plebeius argus*

Recorded at Fairmile Common on 2 August 2012 by Andrew Culshaw.

SILVER-WASHED FRITILLARY *Argynnis paphia*

The silver-washed fritillary has a preference for broad-leaved woodland in which the common dog-violet *Viola riviniana* grows though the adult butterflies are typically found along sunny paths and in glades. Silver-washed fritillaries were reported at Bishop's Wood, just beyond the Greater London boundary north of Hillingdon (Wood 2013), and at Black Park (TQ0184) where they were observed by Andrew Culshaw on 25 July 2012.

Discussion

Populations of butterflies fluctuate annually due to, amongst other factors, the effect of weather on the various stages of their life cycles. For that reason relatively small changes in the indices may not be as significant as longer-term trends. However, 2012 was noted for unusual weather conditions; firstly the continuing of a period of low rainfall into early spring; and then one of the wettest springs and summers recorded in England.

Of the thirty-four species recorded on transects in London during either 2011 or 2012, twenty-six had reduced population indices compared with 2011, while eight species had increased indices. The species with increased indices were chalkhill blue, red admiral, painted lady, Glanville fritillary, marbled white, gatekeeper, meadow brown and ringlet.

Of London species, the UK Butterfly Monitoring Scheme (www.ukbms.org 2013) noted that thirty-one had lower national indices in the UK in 2012 compared with 2011, while chalkhill blue and meadow brown increased. For the UK in 2012, several butterfly species registered their lowest index since monitoring commenced (usually in 1978) and these included the small skipper, large skipper, large white, small white, green-veined white, green hairstreak, white-letter hairstreak, common blue, and white admiral. It was the second lowest year for the brimstone, brown argus, and small tortoiseshell.

Within London, habitat change has affected many species, for example through urbanization, the loss of acid grassland and other habitats. However, the speckled wood and gatekeeper have colonized green spaces in urban London during recent decades (Fox and Williams 2006), while populations of the marbled white and ringlet have established at a limited number of green space sites. The brimstone has established populations at green spaces, particularly in urban north London and for that species the planting of the larval food plants is considered to have been a factor.

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The distribution and abundance of the wild service tree *Sorbus torminalis* in Ruislip Woods

JON GURR
26 Salcombe Way, Ruislip, Middlesex HA4 6BA
jon.gurr@btinternet.com

Abstract

Sorbus torminalis (L.) Crantz is a scarce tree in the British Isles and where found in woodland the population density tends to be very low. An investigation into the distribution, abundance and health of the wild service tree population in Ruislip Woods, London Borough of Hillingdon, was carried out in the spring of 2013. In total 239 individuals were located, spread unevenly throughout the woods. The wild service tree is predominantly found growing in coppice compartments and appears to take full advantage of elevated warmth and light levels, and probably the effects of reduced competition from more vigorous woodland canopy trees.

Introduction

In the British Isles the wild service tree *Sorbus torminalis* (L.) Crantz is an endemic, rare and scattered tree, mostly confined to ancient semi-natural woodlands, and where found it usually occurs as a single individual or in a small group, either in a woodland or in a hedge close by; discrete population numbers tend to remain small, often not exceeding one hundred individual trees (Angelone et al. 2007; Nicolescu et al. 2009).

Sorbus torminalis is described as a medium-sized deciduous tree growing typically to 15–25 metres tall, with a trunk that can grow exceptionally to over one metre in diameter. When young the bark is smooth and silvery-grey and generally has raised and regular lenticels, somewhat like wild cherry *Prunus avium*. As the bark ages it becomes flaky, peeling away in squarish plates to reveal darker, almost chocolate brown, smooth patches (Figure 1). The leaves are 6–14 centimetres long and the basal pair of lobes are spreading (Figure 2), the rest more forward-pointing and decreasing in size to the leaf apex, and with finely toothed margins; the undersides have small hairs when young, but both sides are smooth and shiny when older; the autumn colour is yellow to red-brown (Figure 3) (Rushforth 1999).

The flowers are 10–15 millimetres diameter, with five white petals and twenty creamy-white stamens; these are produced in corymbs 5–12 centimetres in diameter in late spring to early summer, and are both hermaphrodite and insect pollinated (Figure 4). The fruit is a globose to ovoid pome 10–15 millimetres in diameter, greenish to russet or brown, patterned

FIGURE 1. The bark of a mature wild service tree.

FIGURE 2. The shape of the *Sorbus torminalis* leaf is very distinctive.

FIGURE 3. The variety of autumn leaf colours of the wild service tree.

FIGURE 4. A cluster of *Sorbus torminalis* flowers shortly before inflorescence.

FIGURE 5. A mature double-stemmed wild service tree that was probably last coppiced over fifty years ago.

FIGURE 6. A mature wild service tree surrounded by clonal immature suckers.

with small pale lenticel spots when mature in mid to late autumn (Rushforth 1999). Typical associated trees are common oak *Quercus robur,* sessile oak *Q. petraea,* beech *Fagus sylvatica* and ash *Fraxinus excelsior,* but it occurs with a range of other species, including hornbeam *Carpinus betulus* (Rodwell 1991–2000). The wild service tree shows a marked preference for two kinds of soil: those derived from clays and those derived from harder limestones (Stace 2010); apparently it does not appear on wet soils. Rich et al. (2010: 203–207), provide an excellent overview of the species.

In Britain, which is on the north-western edge of the species' range, the wild service tree's principal method of propagation is by suckers (Rushforth 1999; Rackham 1995; Rich et al. 2010), which can be stimulated by coppicing, although only a few of these develop into full-grown trees (Figure 5). The wild service tree tends to favour reproducing by sucker rather than by seed on the edge of its natural range, e.g. see Rasmussen and Kollmann (2007). Vegetative reproduction by root suckering occurs frequently and may increase the tree's competitive abilities. Demesure-Musch and Oddou-Muratorio (2004) suggest that this is a major way to colonize disturbed areas and to survive the competition from other species. Rackham (1995) lists the species' methods of regeneration: seed-poor; suckers-good; coppicing-good, and states the trees' natural habit is being clonal and its response to coppicing as sprouting.

According to Rich et al. (2010) suckers from mature root stock may form clonal groups of trees in some woods (Figure 6) so that a group of *Sorbus torminalis* trees is likely to be a clone and, being self-incompatible, fail to produce viable seed (though fruit will be produced as they are parthenocarpic, meaning that fruit is produced without pollination) unless individuals of another clone are growing nearby.

The wild service tree is considered to be light-demanding through to semi-shade, growing singly or in little groups (clusters). Research from various European countries within its natural range supports the view that this species is both phytophilous and thermophilous, e.g. Romania (Dinca 2000); Slovakia (Paganová 2008); Czech Republic (Madera et al. 2013). *Sorbus torminalis* grows best in low, open woodland and can compete to become a canopy tree. However, it rarely maintains itself in dense, closed woodland, and where this occurs it remains vegetative (i.e. producing suckers from a parent tree, especially if these are near the soil surface or are damaged) (Rich et al. 2010). If it is overshaded by trees that grow more rapidly, the wild service tree can survive although its growth rate diminishes dramatically (Demesure-Musch and Oddou-Muratorio 2004; Bednorz 2007; Hoebee et al. 2007; Oddou-Muratorio et al. 2005), and it will not flower and fruit.

Nicolescu et al. (2009) state that height growth diminishes quickly after twenty to thirty years of age and stops at sixty to seventy years. If *Sorbus torminalis* lacks light from above and growing space between the ages of ten to twenty years of age its height growth diminishes quickly and remains as an underwood tree species. At a young age the wild service tree is tolerant of shading, but its requirement for sunlight increases with age (Paganová 2008). The wild service tree is most favoured when growing in coppice-with-standards woodlands, which are harvested and regenerated every twenty to thirty years (Nicolescu et al. 2009). It seem that habitat quality (i.e. openness) is very important: Madera et al. (2012) state that the 'ecological requirements of the wild service tree are entirely satisfied only under management as a coppice with standards'. If the wild service tree is to achieve the status of a

large, mature tree it needs an abundance of light and this is most likely to be discovered on the edge of a woodland ride or path, or through a long-term coppice regime.

It is likely that *Sorbus torminalis* was originally scattered throughout woodlands within its European range, including the British Isles, and that eventually humans favoured it via woodland management, i.e. the open aspects derived from coppice-with-standards model (Madera et al. 2013). However, the decline of coppices by conversion towards high forests, especially in the twentieth century, has contributed to the present rarity of the species (Savill 1991; Hoebee et al. 2006). Madera et al. (2012) believe the reason for the decline of *Sorbus torminalis* across many woodlands in numerous European countries is that with the closing of the woodland canopy the species does not regenerate.

Sorbus torminalis is recorded as being a thermophilous species at the limit of its range in Britain, which means in practice that the trees only fruit well after warm summers, and it therefore frequently misses one or more seasons of fruiting (Roper 1993). Moreover, in Britain summer temperatures can often be too low for the seeds to ripen and thus produce little or no viable seed (Milner 2011). Gabrielian (1961) stated that the reasons for its low rate of reproduction from seed may be due to the fact that the species evolved in dry, open woodlands and there is ample evidence to show that climatic conditions affect the tree's ability to flower and produce viable fruit; warm summers promote fruit formation and increase the numbers of seeds per fruit.

In Britain, like those of other rosaceous trees, the seeds of wild service require prolonged cold in order to break their dormancy (two weeks of warmth followed by fourteen to sixteen weeks of cold stratification (Forest Research 2012). Roper (1993) notes that in places where winters are longer and colder than in much of Britain, germination will normally take place in the first spring following seed formation, whereas in Britain two or more years are often needed and therefore the seed is at risk for far longer.

Prime (1960) thought that although the fruit is avidly devoured by birds, wild service seems only rarely to be bird-sown; the seed, with its thin seed coat or testa, is probably digested in the bird's gut. In large, lowland forests (such as in many parts of mainland Europe, and probably in the British Isles up until the early Middle Ages) wild boar and other animals, including domestic pigs and cattle, may well have been important agents for the dispersal and burial of wild service seed. Tansley (1968) noted that where the wild boar was found, as well as burying much seed by rooting and trampling, it (as well as the higher numbers of predatory birds and other animals that were formerly widespread) also destroyed many small rodents. Populations of voles and mice have increased substantially as predators have declined and grey squirrels, which eat seeds or seedlings of the wild service tree, have been introduced and have spread. Fruits which have fallen intact are gathered together in piles with the seeds missing, presumably eaten by small mammals (Rich et al. 2010). Seed is extensively predated by birds, small mammals and invertebrates (such as the parasitic wasp *Torymus druparum* (Rich et al. 2010)), so that almost none remains (Roper 1993).

From results obtained from a national survey of the distribution of *Sorbus torminalis* in the British Isles, Roper (1993) was able to summarize the species' distribution in the south-east of England as follows: '. . . records spread in a continuum, with some local concentrations, from the Essex coast to the

borders of Buckinghamshire and Berkshire in the west and Kent and Surrey in the south. Virtually all are associated with London or Boulder Clays and the gravelly soils that overlie them. Many represent survivors, or descendents, of trees from the large forests of Essex and Middlesex which encompassed the smaller forests of Epping, Hatfield and others'. And 'to the west the tree is still remarkably well-distributed within the London Clay triangle of north-west London'.

The earliest record of the wild service tree in Middlesex is from John Gerarde in 1597. Trimen and Dyer (1869: 107, 423) described the tree as 'rather rare' in the county, and Kent's view in 1975 was that it was 'rare and decreasing, and mainly confined to the northern parts of the vice-county' (Kent 1975: 298). Modern records for the distribution of the wild service tree show that it is to be found in woodlands throughout the Greater London area, for example, Coldfall Wood and Queen's Wood (Bevan 2011); Hampstead Heath and Kenwood (Wright 2001); and Epping Forest (Lloyd 1977). At a wider scale studies on the distribution and abundance of wild service trees across many European countries have been undertaken (e.g. in Germany: Müller et al. 2000; Italy: Belletti et al. 2008; France: Oddou-Muratorio et al. 2005; Switzerland: Angelone et al. 2007; Czech Republic: Madera et al. 2012, 2013; Poland: Bednorz et al. 2012; Slovakia: Paganová 2007).

Harper (1981) surveyed Hertfordshire and Middlesex for the presence of the wild service tree and in doing so noted the largest and most notable specimens where he found them. He made reference to the wild service trees in Ruislip Woods, the study site, and noted that the species was growing throughout the woods. In his opinion some of the mature specimens were amongst the best in Middlesex and he was of the view that such sites have a very high conservation value.

Ruislip Woods comprises four adjoining oak and hornbeam woods in the north of the London Borough of Hillingdon (LBH), west London, in what used to be north-west Middlesex. The four woods are Park Wood at 100 hectares (248 acres); Copse Wood at 75 ha (186 acres); Mad Bess Wood at 56 ha (138 acres); and Bayhurst Wood at 39 ha (98 acres), totalling 271 ha (670 acres). The woods are managed by LBH and are designated as both a National Nature Reserve (NNR) and Site of Special Scientific Interest (SSSI). Ruislip Woods include one of the most extensive oak standards with hornbeam coppice woods in south-east England (Ruislip Woods NNR Management Plan 2010–2015). In 1982 LBH adopted the Ruislip Woods Long Term Management Plan (RWLTMP) prepared by the Ruislip-Northwood Woods Advisory Working Party (1982) and approved by the then Nature Conservancy Council. The RWLTMP provides the basis for the future of the woodlands for at least one hundred years from 1982 by returning to the traditional way of management, using a twenty-year coppice cycle, and a ten-year light thinning-inspectional cycle for non-coppice areas.

Two previous botanical surveys of Ruislip Woods have been undertaken, both of which noted the presence of the wild service tree, found to be scattered throughout the woods (Wrighton 1979; Bowlt 2011). Although these surveys provided a broad picture of the spread of the species across Ruislip Woods very little detail was hitherto known about the local population. Therefore, a botanical survey was initiated with the aim of describing the present distribution and abundance of the species in Ruislip Woods. In addition, a quick health check on the population was undertaken by recording aspects of

crown health and crown class across all trees located, and noting, where observed, any threats to health.

Survey methods

To locate the wild service trees regular and thorough pre-survey walks were undertaken throughout the woods between early 2011 and early 2013, with a full recording botanical survey subsequently carried out during the spring of 2013. Each located tree was given a unique ordinal number and an aluminium tree tag was attached to the tree. A Garmin GPSMAP 60CSx hand-held GPS receiver was used to record the grid references. Diameter at 1.5 metres from the ground was measured using a diameter tape; trees were assigned to one of three classes: saplings — at least thirty centimetres tall and up to six centimetres in diameter at 1.5 metres from the ground — dbh; young — between six and twenty centimetres dbh; and mature — twenty-one centimetres or more dbh. Where a tree was found with multiple stems each stem dbh was recorded individually. The height of the tree was noted using a hand-held clinometer (Haglöf HB443 Electronic Clinometer). Observed growth form was noted, for example maiden or coppiced tree. Management of the immediate area was categorized as either coppiced or uncoppiced; the coppice compartment within each wood was noted, following the original management plan coppice compartments (RWLTMP); and each tree was recorded as either forming part of a cluster or growing as an isolated individual. Crown class was categorized as dominant, co-dominant, intermediate, or overtopped. Crown health ratings were categorized as healthy, light to moderate decline, severe decline, and dead. Specific, observable threats to tree health were assessed and noted. A hand-held voice recorder (Olympus VN-7600) was used throughout the survey to record observations whilst in the woods, which proved to be a helpful and practical tool.

Results

The sites of the trees located and recorded are shown in Figure 7; the raw data are provided in Table 1. In total 239 wild service trees were located across Ruislip Woods. This figure is considerably higher than was previously estimated when it was thought that there might be upwards of fifty or so wild service trees in Ruislip Woods. The population structure consists of twenty-two mature trees (9 per cent), seventy-six young trees (32 per cent), and 141 saplings (59 per cent). In addition, one planted memorial tree is included amongst the individuals recorded as a sapling.

Sorbus torminalis is described as a scattered species that combines extensive range with low density, usually less than one tree per hectare (Oddou-Muratorio et al. 2004, 2005; Demesure-Musch and Oddou-Muratorio 2004). This would appear to be the case in Ruislip Woods as the results show that the wild service tree is found at an average density (239 trees across 271 hectares) of 0.88 trees per hectare (or 0.36 trees per acre), which is about one wild service tree for every three acres. From a review of the literature the density of wild service trees in Ruislip Woods appears to be relatively high compared to other locations in Greater London. For example, Lloyd (1977) found a density of one mature tree per 103 acres in Epping Forest (61 mature trees across 6,300 acres) and Wright (2001) found a density of one mature tree per 42 acres on Hampstead Heath and in Kenwood (19 mature trees across 791

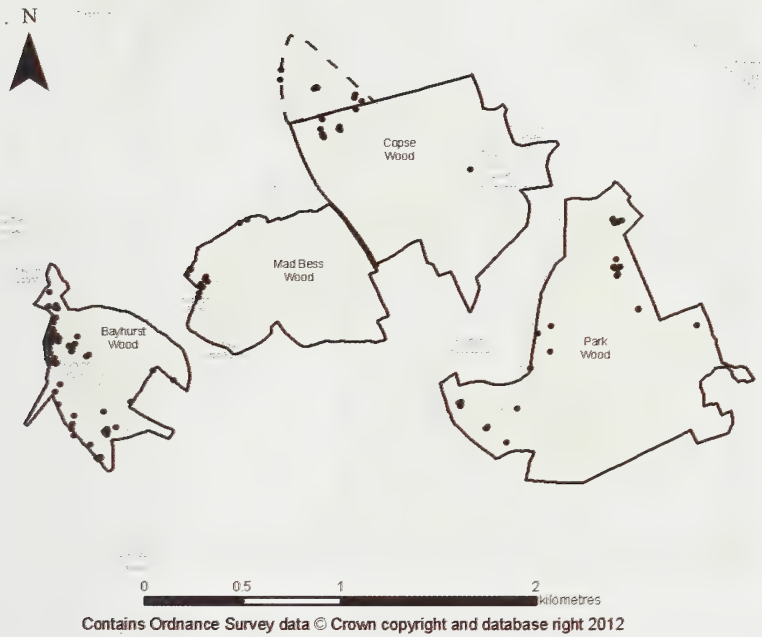

FIGURE 7. The distribution of sites of *Sorbus torminalis* trees in Ruislip Woods.

acres). As such, one mature tree per 30 acres in Ruislip Woods (22 mature trees across 640 acres) appears to compare favourably.

The wild service tree population in Ruislip Woods is spread over seventy sites across the four woods, with twenty-nine clusters and forty-one isolated locations. A typical cluster involves a mature tree and what appears to be a number of either vegetative suckers or seedlings growing close to the mature tree, possibly the 'parent' tree; further research is necessary in order to clarify these relationships. Isolated trees tend to be tens to hundreds of metres away from the nearest other tree. The population appears to be distributed unevenly across the four woods, for example, although Bayhurst Wood accounts for just 15 per cent of the woodland by area it is home to 34.5 per cent of the total wild service tree population in Ruislip Woods. Conversely, Copse Wood is the second largest woodland block with 28 per cent of woodland cover but it contains just 13.5 per cent of the population.

Across the woods the wild service tree was located on well-drained, heavy clay soils, and rarely on or close to standing or running water. In many instances the trees appear to be taking full advantage of the woodland edge effect where light and heat levels are often slightly elevated compared with locations in closed woodland canopy areas; many trees were found with a southern or western aspect, for example growing in open coppice areas, close to woodland edges, paths or bridleways. Conversely, many apparently suitable sites are devoid of the wild service tree; Lloyd (1977) obtained similar findings in Epping Forest.

The species is overwhelmingly (90 per cent) found in coppiced compartments, and these compartments include those that are in-cycle, that is

to say are actively coppiced within the twenty-year coppice rotation, and also within coppice compartments that are out of cycle and may not have been coppiced for sixty years or more. Conversely, just 10 per cent of the trees located are growing in non-coppice locations, i.e. within the non-coppiced sections of the woods or perhaps near or within a hedge line. Observations from this survey show that the wild service tree responds well to coppicing (for example see Figures 5 and 8).

FIGURE 8. A coppiced wild service tree showing strong callous wood enclosing the old coppice cut, and new growth forming.

Rackham (1995) stated that *Sorbus torminalis* rarely regenerates sexually, i.e. via seed, and it is much more likely to regenerate vegetatively from suckering or from coppice regrowth. Although the results appear to show that many trees were indeed suckering the results also indicate that, particularly with many of the isolated trees, a significant proportion may have generated from seed; further research is needed.

Crown class findings show the majority of the population was categorized as overtopped, at 70 per cent; 19 per cent are rated as intermediate; 8 per cent of the crown class was categorized as co-dominant; and 3 per cent were found to fall within the dominant crown class. Simplistically, the abundance of trees that are shaded out can be explained by the fact that 91 per cent of the population is either categorized as a sapling or as a young tree, and therefore they are not likely to be large enough to compete for canopy space. With reference to crown health 76 per cent of crowns were recorded as healthy; 20 per cent were recorded as light or moderate decline in health; and the remaining 4 per cent of crowns were classed as severely declining. Although the majority of the crowns were healthy they were also overtopped and this will have implications for sexual reproduction.

A limited range of threats was observed; possibly the most significant threat to the viability of the population is for saplings and young trees to become, or to stay, overtopped, which has important implications for maturation and reproduction; as noted, the majority of trees are overtopped. The coppicing effects on a small, discrete population may have a detrimental effect if the trees are regularly recut before they have the chance to mature and contribute to the regeneration (vegetatively and sexually) of the local population. Some trees were found to have sustained damage to their crowns from falling heavy branches, and some of the mature trees are showing various morphological effects of ageing, although trees that may be described as veteran or eventually ancient have many positive attributes in terms of biological diversity within a woodland habitat; perhaps less than ten of the mature trees could be classed as veteran, and none in my view is of ancient status. Some limited basal stem and bark damage was observed on several saplings, most likely a combination of deer and squirrel activity.

No tree pests or diseases known to affect *Sorbus torminalis* were observed during the survey. According to Hemery et al. (2010) the types of pests and diseases that can affect this species, especially predicted through the continued impacts of a changing climate, range from European canker of apple *Nectria galligena* Bres. and apple scab *Venturia inaequalis* Cooke (Wint.), both of which can cause premature leaf fall; and *Verticillium* wilt which causes wilting and dieback of branches. Warmer and wetter conditions in the future could stimulate fireblight *Erwinia amylovora* (Burrill).

Discussion

Close to 240 individual wild service trees were found during this survey. Taking into account the size profile of the trees, from individuals less than five years old and less than a metre in height to large, mature trees possibly 200 years old with some of the trees over twenty metres in height, it is clear that this is an established population, and perhaps one that can be considered relatively healthy.

Given the ease to which this species appears to evade detection it would not be surprising to find further individuals in the future. The experience of locating this species in Ruislip Woods suggests that if a woodland is known to contain a population of wild service trees it is well worth spending the time looking closely at all areas in order to be sure that all or as many trees as possible are located. Another point that is worth making is that the advice given when searching for the wild service tree is to look for the fallen leaves on the ground. Admittedly the leaf shape is very distinctive, however, I have found that by familiarizing myself with the silhouette of the tree, particularly the sparse nature of the branches and twig, the small, rounded light-green apical buds, and the distinctive colour and texture of the bark, it is easy enough to quickly scan the woodland around you and to make steady progress on your search.

The survey findings show that the majority of the wild service trees in the Ruislip Woods are found in coppice compartments and that some of these individuals have been formerly coppiced and that they respond well to being coppiced. Suckers appear to arise from both coppiced and maiden trees. A fair proportion of the isolated individual trees found may still have arisen as suckers, either from parent trees that are some distance away or perhaps the parent tree has since died leaving the 'sucker' isolated. However, logic suggests that some of these isolated trees may well have arisen from seed, although within this survey it was not possible to determine whether the trees were

physically attached to other trees and therefore whether they were from seed. Lloyd (1977) speculated that wild service trees growing as suckers would display a distinctive convex lean at the base of the tree for several decimetres before straightening up and that this lean would be towards the parent tree. He also suggested that seed trees would display no such lean. My observations are that a small proportion of trees did show such a lean, but the vast majority of the trees showed either no lean at all or else the lean was convex but away from the parent tree, and this was found especially with trees that are thought to be of sucker origin. The lean away from either the parent tree or other trees close by is most likely to be associated with the need to move away from the shade formed by the canopies of these established trees in order to maximize photosynthesis and early stage growth.

Sorbus torminalis is a tree that formerly profited from more intense use of woodland resources. Former mosaics of coppiced woodland across landscapes provided plenty of habitat patches for this early successional species. With the transformation towards high stands with closed canopies during the nineteenth and twentieth centuries populations became smaller and less abundant (Hoebee et al. 2007). Remnant wild service trees came to be dominated by late successional trees, for example, oaks, hornbeam and beech, and ceased to flower and fruit. Current populations might thus form non-viable local populations, although they might survive for extended periods due to *Sorbus torminalis'* ability to propagate clonally. Consequently, conservation measures should try to mimic former traditional woodland management practices, such as coppicing, at both local and landscape scales. The current twenty-year coppice cycle carried out on an annual basis in Ruislip Woods would appear to be an important factor in the success of this species locally.

Further research in this area is planned. The author would be pleased to receive correspondence with individuals interested in this study area.

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Table 1 — Data analysis of the wild service trees examined

Column 1. Tree No. – the assigned tree number with aluminium tag attached.

Columns 2 and 3. Grid ref. – six-figure references for eastings and northings.

Column 4. Diameter of the tree at 1.5 metres from the ground; where multiple stems located each stem is recorded separately.

Column 5. Age class – S = sapling; Y = young; M = mature.

Column 6. Comp. – compartment where the tree is located; first letter denotes the woodland, second letter denotes the compartment, the following number (if given) denotes the sub-compartment.

Column 7. Height (m) – height recorded in metres and centimetres.

Column 8. Crown Class – **D**ominant : crown extends above the general canopy layer for the stand; crown intercepts direct sunlight across the top and along sides of the upper branches; crown well developed and large, though usually somewhat crowded along lower branches; tree diameter usually among the largest in the stand. **C**o-dominant: crown within and helping to form the main crown canopy for the stand; crown intercepts direct sunlight across the top, but only at tips of the upper side branches; crown well developed, but of only medium size and crowded at the sides; tree diameter among the upper range of those present, but not the largest. **I**ntermediate: crown extends somewhat into the lower part of the main canopy; crown intercepts direct sunlight only at a limited area on the top and none at the sides; crown narrow and short, with limited leaf surface area and a low live crown ratio; tree diameter within the lower range of those present. but not necessarily the smallest. **O**vertopped: crown entirely below the main canopy and covered by branches of taller trees; no direct sunlight strikes at any portion of the crown; crown small, often lopsided; flat-topped and sparse; tree diameter among the smallest in the stand.

Column 9. Crown health – **H**ealthy: 0–10% crown dieback; appears in good health; no major branch mortality; <10% branch/twig mortality. **L**ight to Moderate decline: 11–50% crown dieback; branch and twig mortality <50% of the crown; <50% branch/twig mortality. **S**evere decline: greater than 50% crown dieback; branch and twig mortality >50% of the crown; >50% branch/twig mortality. **D**ead: tree is dead, either standing or down.

Column 10. Unit mgt – whether the unit or compartment is coppiced or non-coppiced.

Column 11. Isolated or clustered – whether the individual tree was found to be isolated or part of a local cluster of wild service trees.

Column 12. Threats – threats observed such that s/out = split out; o/top = overtopped; n/app = none apparent; c/d-b = crown dieback; age = ageing; p/f = poor form; t/r/o = top ripped out; b/d = basal damage or decay; cop = coppicing; v-s = very small; c/b = cutting back from footpaths/bridleways; s/c = soil compaction; p/w = path widening; dec = declining; s/d = stem decay; th = thinning.

Tree no.	Grid Ref.	Grid Ref.	Diameter at 1.5 m from ground	Age class	Comp.	Height (m)	Crown class	Crown health	Unit mgt.	Isolated or clustered	Threats
B0001	507138	188890	11.2/24.5/37.2/18.3/39.6/30.3/27.5	M	B/E	16.4	C	H	C	C of 2	s/out
B0002	507135	188889	6.8	Y	B/E	3.5	O	H	C	C of 2	o/top
B0003	507032	188960	48.5, 16.7	M	B/F	17.1	C	H	N/c	I	o/top
B0004	506917	188773	7.1	Y	B/F	5	O	H	N/c	I	o/top
B0005	506780	188722	7.2/5.6/10.4	Y	B/I	7.5	O	H	C	I	o/top
B0006	506844	188642	60.6	M	B/G/11	20	C	H	C	C of 10	n/app
B0007	506797	188627	24.4/7.9	M	B/G/11	15	C	H	C	C of 10	n/app
B0008	506795	188630	22.4	M	B/G/11	15	C	H	C	C of 10	n/app
B0009	506794	188630	31.5/6.5	M	B/G/11	15	C	H	C	C of 10	n/app
B0010	506788	188612	6.7/3.2	Y	B/G/11	3.5	O	L	C	C of 10	o/top
B0011	506797	188602	5.4	Y	B/G/11	4	O	L	C	C of 10	o/top
B0012	506785	188618	6.8	Y	B/G/11	4.5	O	H	C	C of 10	o/top
B0013	506788	188614	4.5	S	B/G/11	3	O	L	C	C of 10	o/top
B0014	506789	188620	1. 2	S	B/G/11	2.5	O	H	C	C of 10	o/top
B0015	506798	188618	10.4	Y	B/G/11	6	O	H	C	C of 10	o/top
B0016	506761	188487	0.5	S	B/H	1	I	H	C	C of 10	cop
B0017	506762	188486	0.5	S	B/H	1	I	H	C	C of 10	cop
B0018	506763	188487	1	S	B/H	2	I	H	C	C of 10	cop
B0019	506765	188485	2	S	B/H	3	I	H	C	C of 10	cop
B0020	506743	188486	9.6	Y	B/H	3	I	H	C	C of 10	cop
B0021	506754	188478	9.3/5.5/6.7	Y	B/H	3	I	H	C	C of 10	cop
B0022	506753	188477	3.8/7.9	Y	B/H	3	I	H	C	C of 10	cop
B0023	506752	188476	7.3	Y	B/H	3	I	H	C	C of 10	cop
B0024	506613	188631	11.8, 13.6	Y	B/H	7	I	H	N/c	C of 2	o/top
B0025	506619	188656	0.5	S	B/H	1	O	H	N/c	C of 2	o/top
B0026	506547	188757	4.4, 4.6	S	B/J	4.5	O	H	N/c	I	o/top
B0027	506528	188823	0.5	S	B/J	1.5	O	H	N/c	I	o/top
B0028	506514	188969	1.5	S	B/A	2	O	S	C	C of 4	o/top
B0029	506525	188995	0.5	S	B/A	1	O	H	C	C of 4	o/top
B0030	506537	188970	0.5	S	B/A	1	O	H	C	C of 4	o/top
B0031	506532	188965	1	S	B/A	1.5	O	H	C	C of 4	o/top
B0032	506491	188992	0.5, 1.5	S	B/A	1.5	O	H	C	I	o/top
B0033	506504	189019	49.8	M	B/A	18	D	S	C	I	c/d-b
B0034	506702	189011	9.7	Y	B/B	8	O	H	C	C of 2	o/top, cop
B0035	506691	189002	0.5	S	B/B	1	O	H	C	C of 2	o/top, cop

Tree no.	Grid Ref.	Grid Ref.	Diameter at 1.5 m from ground	Age class	Comp.	Height (m)	Crown class	Crown health	Unit mgt.	Isolated or clustered	Threats
B0036	506626	188701	10.4	Y	B/J	8	O	H	N/c	I	o/top
B0037	506556	188861	2	S	B/J	2	O	H	C	I	o/top, cop
B0038	506500	189045	16	Y	B/A	9	I	H	C	C of 12	o/top
B0039	506494	189069	0.5	S	B/A	1	O	H	C	C of 12	o/top
B0040	506495	189081	6	Y	B/A	4.5	O	H	C	C of 12	o/top
B0041	506495	189080	2	S	B/A	3	O	H	C	C of 12	o/top
B0042	506515	189079	0.5	S	B/A	0.5	O	H	C	C of 12	o/top
B0043	506504	189091	2	S	B/A	2	O	H	C	C of 12	o/top
B0044	506502	189104	0.5	S	B/A	1	O	H	C	C of 12	o/top
B0045	506512	189090	2.6	S	B/A	3	O	H	C	C of 12	o/top
B0046	506512	189090	6	Y	B/A	4.5	O	H	C	C of 12	o/top
B0047	506502	189098	3	S	B/A	2.5	O	H	C	C of 12	o/top
B0048	506549	189095	63.6	M	B/A	18.7	C	L	C	C of 8	age
B0049	506549	189095	3, 4	S	B/A	3.5	O	H	C	C of 8	o/top
B0050	506543	189094	5	S	B/A	4	O	H	C	C of 8	o/top
B0051	506544	189087	1	S	B/A	1	O	H	C	C of 8	o/top
B0052	506547	189081	2	S	B/A	2	O	H	C	C of 8	o/top
B0053	506532	189093	2.5, 2, 1	S	B/A	3	O	H	C	C of 8	o/top
B0054	506540	189108	1	S	B/A	1	O	H	C	C of 8	o/top
B0055	506528	189107	1	S	B/A	1	O	H	C	C of 8	o/top
B0056	506517	189129	0.5	S	B/A	1	O	H	C	C of 4	o/top
B0057	506522	189135	9.1	Y	B/A	6	I	H	C	C of 4	o/top
B0058	506508	189136	15.8, 9.5	Y	B/A	6	I	H	C	C of 4	o/top
B0059	506516	189143	10.4	Y	B/A	8	I	H	C	C of 4	o/top
B0060	506522	189175	7.9	Y	B/A	5.5	I	H	C	I	o/top
B0061	506522	189198	1, 1	S	B/A	1	O	H	C	I	o/top
B0062	506532	189200	11.2	Y	B/A	7	I	H	C	C of 2	o/top
B0063	506525	189199	9.8	Y	B/A	5	O	H	C	C of 2	o/top
B0064	506493	189256	8.8	Y	T/L	6	O	H	N/c	C of 2	o/top
B0065	506497	189259	10.8	Y	T/L	8	O	H	N/c	C of 2	o/top
B0066	506499	189332	16.8	Y	T/L	9	O	H	N/c	I	o/top
B0067	506529	189253	11.9, 6.2	Y	T/L	8	O	H	N/c	I	o/top
B0068	506533	189264	10	Y	T/L	7	O	H	N/c	I	o/top
B0069	506542	189247	5.8	Y	T/L	5	O	H	N/c	I	o/top
B0070	506645	189105	15.4, 6.1	Y	B/B	8	I	H	N/c	C of 7	n/app
B0071	506632	189065	1.5	S	B/B	2	O	D	N/c	C of 7	p/f

Tree no.	Grid Ref.	Grid Ref.	Diameter at 1.5 m from ground	Age class	Comp.	Height (m)	Crown class	Crown health	Unit mgt.	Isolated or clustered	Threats
B0072	506602	189055	3.1	S	B/B	3.5	O	H	N/c	C of 7	t/r/o
B0073	506605	189052	2.5	S	B/B	2	O	L	N/c	C of 7	t/r/o
B0074	506603	189057	4.6	S	B/B	3	O	L	N/c	C of 7	t/r/o
B0075	506615	189030	5.7	Y	B/B	5	O	H	N/c	C of 7	o/top
B0076	506620	189047	4.1	Y	B/B	4	O	H	N/c	C of 7	b/d
B0240	507658	189230	6.9	Y	B/B	6.6	O	H	C	I	o/top
B0241	506618	189104	16	Y	B/B	7.1	I	H	C	I	
B0242	506576	189071	2	S	B/B	2	I	H	C	C of 2	o/top
B0251	506585	189062	3.5, 3	S	B/B	4.5	O	H	C	C of 2	o/top
B0252	506525	189153	1	S	B/A	2	O	H	C	I	o/top
B0253	506779	188728	7.8	Y	B/I	9.2	O	H	C	I	o/top
M0077	507265	189297	0.5, 0.5, 0.5	S	M/B/F/4	1	O	H	C	I	o/top, cop/v-s
M0078	507268	189330	3.8	S	M/B/F/4	2	O	H	C	C of 2	o/top, cop
M0079	507270	189330	1	S	M/B/F/4	1.5	O	H	C	C of 2	o/top, cop
M0080	507270	189361	6.7, 2	Y	M/B/E/19	4.5	I	H	C	C of 43	o/top, cop
M0081	507280	189361	5.6, 4.4	Y	M/B/E/19	4	I	L	C	C of 43	o/top, cop
M0082	507281	189361	9.1	Y	M/B/E/19	5	O	L	C	C of 43	o/top, cop
M0083	507283	189360	0.5, 0.5	S	M/B/E/19	1	O	L	C	C of 43	o/top, cop
M0084	507284	189359	3, 1	S	M/B/E/19	3.5	O	H	C	C of 43	o/top, cop
M0085	507283	189359	2	S	M/B/E/19	2.5	O	H	C	C of 43	o/top, cop
M0086	507275	189375	1.5	S	M/B/E/19	2	O	H	C	C of 43	o/top, cop
M0087	507296	189401	3.1, 6.7	Y	MB/E/10	5.5	O	H	C	C of 43	o/top, cop
M0088	507296	189401	8.2, 5.9, 6.1, 5.6	Y	MB/E/10	6	O	H	C	C of 43	o/top, cop
M0089	507296	189401	6.7	Y	MB/E/10	4.5	O	H	C	C of 43	o/top, cop
M0090	507296	189401	6.6	Y	MB/E/10	5	O	H	C	C of 43	o/top, cop
M0091	507296	189401	5.1	Y	MB/E/10	4.5	O	H	C	C of 43	o/top, cop
M0092	507296	189401	2.5	S	MB/E/10	3.5	O	H	C	C of 43	o/top, cop
M0093	507296	189401	3.4, 4.4, 4.2, 7.2	Y	MB/E/10	5	O	H	C	C of 43	o/top, cop
M0094	507296	189401	2.9, 1	S	MB/E/10	4	O	H	C	C of 43	o/top, cop, c/b
M0095	507296	189401	6.3, 3.1	Y	MB/E/10	4	O	H	C	C of 43	o/top, cop, c/b
M0096	507296	189401	3	S	MB/E/10	4	O	H	C	C of 43	o/top, cop, c/b
M0097	507296	189401	3.6, 3.7	S	MB/E/10	4	O	H	C	C of 43	o/top, cop, c/b
M0098	507296	189401	3.9	S	MB/E/10	4	O	H	C	C of 43	o/top, cop, c/b
M0099	507296	189401	4.9, 1.5	S	MB/E/10	4	O	H	C	C of 43	o/top, cop
M0100	507296	189401	76	M	MB/E/10	18	D	H	C	C of 43	age, s/c
M0101	507296	189401	2, 4	S	MB/E/10	4	O	H	C	C of 43	o/top, cop

Tree no.	Grid Ref.	Grid Ref.	Diameter at 1.5 m from ground	Age class	Comp.	Height (m)	Crown class	Crown health	Unit mgt.	Isolated or clustered	Threats
M0102	507296	189401	1.5, 2, 6.2	Y	MB/E/10	4	O	L	C	C of 43	o/top, cop, c/b
M0103	507296	189401	3	S	MB/E/10	3	O	L	C	C of 43	o/top, cop, c/b
M0104	507296	189401	5.2	Y	MB/E/10	4	O	L	C	C of 43	o/top, cop, c/b
M0105	507296	189401	2, 4, 4, 4.6	S	MB/E/10	4	O	H	C	C of 43	o/top, cop, c/b
M0106	507296	189401	3.4	S	MB/E/10	4	O	H	C	C of 43	o/top, cop
M0107	507296	189401	3.6	S	MB/E/10	5	O	H	C	C of 43	o/top, cop
M0108	507296	189401	5.8, 2	Y	MB/E/10	5	O	H	C	C of 43	o/top, cop
M0109	507296	189401	7	Y	MB/E/10	5	O	H	C	C of 43	o/top, cop
M0110	507296	189401	4.7, 3, 4.2, 6.5, 3.2, 4.2	Y	MB/E/10	5	O	H	C	C of 43	o/top, cop
M0111	507296	189401	4.7	S	MB/E/10	4	O	S	C	C of 43	o/top, cop
M0112	507296	189401	4.6	S	MB/E/10	5	O	H	C	C of 43	o/top, cop
M0113	507296	189401	2.6	S	MB/E/10	4	O	H	C	C of 43	o/top, cop
M0114	507296	189401	1	S	MB/E/10	2	O	H	C	C of 43	o/top, cop
M0115	507296	189401	3.1	S	MB/E/10	4	O	S	C	C of 43	o/top, cop
M0116	507296	189401	3, 3.5, 1, 1.5, 1.5	S	MB/E/10	4	O	S	C	C of 43	o/top, cop
M0117	507296	189401	1.2	S	MB/E/10	3	O	S	C	C of 43	o/top, cop
M0118	507296	189401	3.5, 1	S	MB/E/10	4	O	H	C	C of 43	o/top, cop
M0119	507296	189401	2	S	MB/E/10	4	O	L	C	C of 43	o/top, cop
M0120	507296	189401	2	S	MB/E/10	4	O	S	C	C of 43	o/top, cop
M0121	507296	189401	1.5	S	MB/E/10	3	O	L	C	C of 43	o/top, cop
M0122	507296	189401	2.1, 2.8, 2.1	S	MB/E/10	4	O	L	C	C of 43	o/top, cop, c/b
M0123	507205	189420	3	S	M/B/E/18	4	I	H	C	I	o/top, cop, c/b
M0124	507223	189448	6.3	Y	M/B/E/18	3	C	H	C	C of 4	o/top, cop, c/b
M0125	507222	189451	4, 3.5	S	M/B/E/18	3	I	H	C	C of 4	o/top, cop, c/b
M0126	507225	189450	3.2	S	M/B/E/10	3	I	H	C	C of 4	o/top, cop, c/b
M0127	507302	189414	2.5	S	M/B/E/18	2	I	H	C	I	o/top, cop, c/b
M0128	507309	189389	1	S	M/B/S/6	1.5	O	H	C	I	o/top, c/b, v-s
M0161	507515	189702	5.9	Y	M/B/D/7	3.5	O	H	C	I	o/top, cop
M0162	507475	189685	0.5	S	M/B/D/7	1	O	H	C	I	o/top, cop
M0163	507220	189449	2.6, 1.6	S	M/B/E/18	2.5	I	H	C	C of 4	o/top, cop, p/w
M0237	507283	189343	1	S	M/B/4	2	O	H	C	I	o/top
M0238	507267	189391	3	S	M/B/19	3.5	I	H	C	C of 43	o/top, cop
M0239	507250	189488	3.3	S	M/B/E/10	4	I	H	C	C of 5	o/top, cop
C0129	508045	190314	28.5, 12.7, 13.7, 21.8, 33	M	C/P	21.5	D	H	C	I	cop, age
C0130	508100	190327	7.5	Y	C/P	5	I	H	C	I	o/top, cop
C0131	507687	190475	9.1	Y	C/P	6.4	O	L	C	I	o/top, cop

Tree no.	Grid Ref.	Grid Ref.	Diameter at 1.5 m from ground	Age class	Comp.	Height (m)	Crown class	Crown health	Unit mgt.	Isolated or clustered	Threats
C0132	507684	190431	6.1	Y	C/P	7.4	O	H	C	I	o/top, cop
C0133	507898	190218	7.9, 5	Y	C/Y/4	7	I	H	C	I	o/top, cop
C0134	507900	190137	34, 36.9	M	C/Y/4	19	C	H	C	C of 4	cop, age
C0135	507900	190131	2	S	C/Y/4	2	O	S	C	C of 4	dec
C0136	507904	190127	1	S	C/Y/4	1.5	O	L	C	C of 4	o/top, cop
C0137	507896	190142	1	S	C/Y/4	1	O	L	C	C of 4	o/top, cop
C0138	507987	190182	2.4	S	C/X/8	3	O	H	C	C of 3	o/top, cop
C0139	507980	190166	1.5	S	C/X/8	2	O	L	C	C of 3	o/top, cop
C0140	507989	190165	7.8, 8.6	Y	C/X/8	7	I	H	C	C of 3	o/top, cop
C0141	508071	190267	0.5	S	C/X/13	1	O	H	C	I	o/top, cop, v-s
C0164	508658	189960	0.7	S	C/J/5	1.5	O	H	N/c	I	o/t, p/w
C0165	507890	190166	4	S	C/Y/10	3	I	H	C	I	o/top, cop
C0166	507868	190390	38, 42	M	C/P	22	D	H	C	C of 4	n/app
C0167	507856	190375	9.5	Y	C/P	8	O	H	C	C of 4	o/top, cop
C0168	507872	190377	6.5	Y	C/P	4	I	L	C	C of 4	o/top, cop
C0169	507866	190383	3.1	S	C/P	4	O	L	C	C of 4	o/top, cop
C0170	508069	190346	7.8	Y	C/P	4	O	H	C	I	o/top
C0225	507937	190349	20.7	M	Private	12.8	I	H	C	C of 12	o/top
C0226	507937	190349	4	S	Private	3	O	L	C	C of 12	o/top
C0227	507937	190349	3.5	S	Private	3	O	L	C	C of 12	o/top
C0228	507937	190349	2	S	Private	1	O	L	C	C of 12	o/top
C0229	507937	190349	1	S	Private	1	O	L	C	C of 12	o/top
C0230	507937	190349	1	S	Private	1	O	L	C	C of 12	o/top
C0231	507937	190349	1	S	Private	1	O	L	C	C of 12	o/top
C0232	507937	190349	1	S	Private	1	O	L	C	C of 12	o/top
C0233	507937	190349	1	S	Private	1	O	L	C	C of 12	o/top
C0234	507937	190349	1	S	Private	1	O	L	C	C of 12	o/top
C0235	507937	190349	1	S	Private	1	O	L	C	C of 12	o/top
C0236	507937	190349	1	S	Private	1	O	L	C	C of 12	o/top
P0142	509069	189158	4.9	Y	P/S/3	4	O	H	N/c	I	o/top
P0143	509000	189122	15.1, 7.9, 21.5, 29.5, 4.1	M	P/Q/7	15	I	H	C	C of 2	o/top, cop
P0144	509003	189123	23.4	M	P/Q/7	15	C	H	C	C of 2	o/top, cop
P0145	509066	189030	17.8	Y	P/Q/2	10	D	L	N/c	I	o/top, s/d
P0146	508965	188945	11.3	Y	P/Q/10	12	O	H	C	I	o/top, cop
P0147	508612	188772	23.3	M	P/B/15	18	D	H	C	C of 6	cop, b/d
P0148	508611	188771	2	S	P/B/15	3	O	H	C	C of 6	o/top, cop

Tree no.	Grid Ref.	Grid Ref.	Diameter at 1.5 m from ground	Age class	Comp.	Height (m)	Crown class	Crown health	Unit mgt.	Isolated or clustered	Threats
P0149	508597	188767	32.2	M	P/B/15	18	D	H	C	C of 6	cop, age
P0150	508607	188755	47.5 at 10 cm from the ground	M	P/B/15	<1	O	S	C	C of 6	o/t, cop, th
P0151	508605	188758	7.5	Y	P/B/15	7	I	H	C	C of 6	o/t, cop, th
P0152	508607	188751	1.5, 2.5, 2, 7.6, 5.1, 2, 3, 1.5	Y	P/B/15	8	I	H	C	C of 6	o/t, cop, th
P0153	508745	188646	6.1, 4.9	Y	P/C/9/14	6	C	H	C	C of 6	o/top, cop
P0154	508744	188644	6, 5	Y	P/C/9/14	6	C	H	C	C of 6	o/top, cop
P0155	508744	188643	2.4, 3.5	Y	P/C/9/14	5	C	H	C	C of 6	o/top, cop
P0156	508742	188640	3.8	S	P/C/9/14	6	C	H	C	C of 6	o/top, cop
P0157	508740	188638	10.5	Y	P/C/9/14	6	C	H	C	C of 6	o/top, cop
P0158	508738	188636	5.6, 9, 9.6	Y	P/C/9/14	6	C	H	C	C of 6	o/top, cop
P0159	508842	188563	12.2, 23.4, 23.4	M	P/C/10	18	C	H	C	C of 2	o/top, cop
P0160	508844	188565	7.5, 8.3	Y	P/C/10	6	O	H	C	C of 2	o/top, cop
P0171	509519	189242	19, 22	M	P/ R/15	15	C	H	C	C of 4	o/top, cop
P0172	509518	189243	4, 3.2	S	P/ R/15	3	O	L	C	C of 4	o/top, cop
P0173	509515	189248	3.4	S	P/ R/15	3	O	H	C	C of 4	o/top, cop
P0174	509516	189247	1	S	P/R/15	1.5	O	L	C	C of 4	o/top, cop
P0175	509818	189162	25.3, 28.4, 26.6	M	P/K/12	20	C	H	C	I	cop
P0176	509429	189699	6.6	Y	P/T/10	4	I	H	C	C of 4	o/top, cop
P0177	509429	189700	10.7	Y	P/T/10	5	I	H	C	C of 4	o/top, cop
P0178	509430	189701	3.6	S	P/T/10	3.5	I	H	C	C of 4	o/top, cop
P0179	509431	189701	2	S	P/T/10	2.5	O	H	C	C of 4	o/top, cop
P0180	509393	189688	11.2	Y	P/T/10	12	I	H	C	C of 6	o/top, cop
P0181	509393	189687	3.2	S	P/T/10	2.5	O	L	C	C of 6	o/top, cop
P0182	509410	189691	1.1	S	P/T/10	1	O	M	C	C of 6	o/top, cop
P0183	509410	189692	0.5	S	P/T/10	1.5	O	H	C	C of 6	o/top, cop
P0184	509410	189693	2.1	S	P/T/10	3	O	H	C	C of 6	o/top, cop
P0185	509411	189694	1	S	P/T/10	2	O	L	C	C of 6	o/top, cop
P0186	509388	189706	2, 1.5, 3.9	Y	P/U/17	4	I	H	C	C of 2	o/top, cop
P0187	509388	189705	2.2	S	P/U/17	3	O	H	C	C of 2	o/top, cop
P0188	509403	189503	7.4, 4, 3.4, 3.3	Y	P/T/17	5	O	H	C	I	o/top, cop, s/d
P0189	509412	189457	6.4, 7.6, 14.4, 7.6, 3.3, 19.1	M	P/T/2	9	I	H	C	C of 17	o/top, cop
P0190	509410	189457	1, 0.8, 0.5	S	P/T/2	3	O	H	C	C of 17	o/top, cop
P0191	509410	189456	0.8	S	P/T/2	2	O	H	C	C of 17	o/top, cop
P0192	509408	189455	0.5	S	P/T/2	1	O	H	C	C of 17	o/top, cop
P0193	509407	189455	1.2,	S	P/T/2	3	O	H	C	C of 17	o/top, cop
P0194	509406	189454	1	S	P/T/2	2	O	H	C	C of 17	o/top, cop

Tree no.	Grid Ref.	Grid Ref.	Diameter at 1.5 m from ground	Age class	Comp.	Height (m)	Crown class	Crown health	Unit mgt.	Isolated or clustered	Threats
P0195	509406	189453	1	S	P/T/2	2	O	M	C	C of 17	o/top, cop
P0196	509400	189455	2	S	P/T/2	1	O	M	C	C of 17	o/top, cop
P0197	509400	189454	1	S	P/T/2	3	O	L	C	C of 17	o/top, cop
P0198	509400	189453	1.2	S	P/T/2	1	O	M	C	C of 17	o/top, cop
P0199	509391	189461	2	S	P/T/2	1	O	L	C	C of 17	o/top, cop
P0200	509392	189462	1	S	P/T/2	2	O	L	C	C of 17	o/top, cop
P0201	509420	189463	1	S	P/T/2	1.5	I	H	C	C of 17	o/top, cop
P0202	509421	189463	0.5	S	P/T/2	0.3	O	L	C	C of 17	o/top, cop, v-s
P0203	509422	189462	2	S	P/T/2	3	I	H	C	C of 17	o/top, cop
P0204	509423	189462	2.5	S	P/T/2	3	I	H	C	C of 17	o/top, cop
P0205	509423	189463	1	S	P/T/2	0.5	O	L	C	C of 17	o/top, cop
P0206	509412	189427	2.5, 4.3, 3.3	S	P/T/2	5	O	H	C	C of 12	o/top, cop, p/w
P0207	509412	189426	2.3, 2.2, 4, 2.4, 1.4	S	P/T/2	5	O	H	C	C of 12	o/top, cop
P0208	509411	189425	5.1	S	P/T/2	5	O	H	C	C of 12	o/top, cop
P0209	509411	189424	1	S	P/T/2	2	O	L	C	C of 12	o/top, cop
P0210	509410	189424	4.2	S	P/T/2	5	O	H	C	C of 12	o/top, cop
P0211	509410	189423	4	S	P/T/2	5	O	H	C	C of 12	o/top, cop
P0212	509409	189423	2.5	S	P/T/2	3	O	M	C	C of 12	o/top, cop
P0213	509409	189422	3	S	P/T/2	5	O	H	C	C of 12	o/top, cop
P0214	509408	189421	3.7	S	P/T/2	3	O	H	C	C of 12	o/top, cop
P0215	509408	189420	2.5	S	P/T/2	4	O	H	C	C of 12	o/top, cop
P0216	509407	189419	2.2	S	P/T/2	4	O	H	C	C of 12	o/top, cop
P0217	509407	189418	1	S	P/T/2	2	O	H	C	C of 12	o/top, cop
P0218	508898	188736	2, 3.5	S	P/C/10	5	O	H	C	I	o/top, cop

Book review

Butterflies of Surrey revisited. Ken Willmott, Malcolm Bridge, Harry E. Clarke and Francis Kelly (editor). Surrey Wildlife Trust. 2013. 240 pp. Hardback. ISBN 978 0 9556188 4 0. £16, plus £2.75 p. & p. from Atlas Sales, Surrey Wildlife Trust, School Lane, Pirbright, Woking, Surrey GU24 0JN; tel. 01483 795488. Cheques payable to Surrey Wildlife Trust. Also available online at *www.surreywildlifegifts.org.uk/collections/atlas-series*

This volume, No. 14 in the series, arrived just in time for me to look through it and make an assessment and complete the pages of this journal. We have regularly reviewed volumes in this series and *Smaller moths of Surrey*, No. 13, is also reviewed in this issue.

Butterflies of Surrey, the first in the series, was published in 1995 and reviewed by us in *LN* **76** (1997). There have been many changes in the status of Britain's butterflies in the intervening years and Surrey has lost both pearl-bordered and small pearl-bordered fritillaries, the Duke of Burgundy and the wall brown. However, the Glanville fritillary has been controversially introduced to an area near Wrecclesham and seems to be thriving.

This is an extremely fine publication and is the first in the series to be in full colour. It has over a hundred photographs of the butterflies (and some day-flying moths) and a wealth of information on the life histories and habitats of the species as well as detailed descriptions of key sites. It is surely a must for all naturalists in the South-East at least, not only for its photography, but as an example of what can be produced by a dedicated team.

K. H. Hyatt, Editor, *Lond. Nat.*

From herbarium to fungarium — three fungal collections in London

AMANDA WATERFIELD
29 Gloucester Crescent, London NW1 7DL

Abstract

This paper looks at the history of three major fungal collections in London. In the 1830s William Hooker, the first director of the Royal Botanic Gardens at Kew, persuaded the Revd M. J. Berkeley, a Northamptonshire cleric, to work on his fungal collections. Berkeley is now considered 'the father of British mycology'. In 1880 Kew employed its first mycologist and in 1881 the British Museum's natural history collections came to South Kensington. In 1961 the Morton Agreement divided the collections between lichens (NHM) and fungi (Kew). In 1920, after the Great War, a third major collection was formed at Kew with the establishment of the Imperial Bureau of Mycology, and in 2009 the collection came to RBG Kew making it the largest fungal collection in the world, now called a fungarium. These fungal collections are important for identification, education and as an historical resource.

Introduction

Most dictionaries still refer to fungi as flowerless plants or lower plants; however they are not plants at all although historically they have always come under botany. A higher level of classification has now been proposed with life divided into two domains of prokaryotes, Archaebacteria and Bacteria, and a third domain for Eukaryotes with plants (flora), animals (fauna) and fungi (funga) all within it. The fauna of a region is often better known than the flora but funga are only just beginning to feature in our systematization of the natural world. Fungi are thought to be closer to animals than to plants, having various unifying features amongst which are energy storage in the form of glycogen and some esoteric features of nuclear division; this is one of the reasons that it is difficult to treat fungal diseases in man. They do not photosynthesize but do provide plants with essential minerals through symbiotic relationships. They are a vital part of everyday life — the devastation caused by fungal diseases of crops from wheat to coffee, and the great changes in landscape brought about by Dutch elm disease show that fungi are an important part of our living world. There is even a theory that the Carboniferous era changed when fungi learnt to break down the lignin in plant material (Floudas et al. 2012). Their role as recyclers is important. However their systematic study is fairly recent.

Herbaria are thought to have started in the sixteenth century to augment botanical studies. Mycologists used the same method of drying material to affix to sheets but later put the dried material in packets. In the nineteenth century some people earned a living collecting for dealers, especially for exsiccati, which are duplicate collections circulated among collectors. Many of these collections came to be incorporated into these large national collections. At

first descriptions and illustrations were used to describe a species, later spore measurements and chemical reactions were added and changes in technology continue to influence how taxonomy is done. Traditional taxonomy acquired further tools in the form of numerical taxonomy in the 1950s, with computers used to sort characters that had been weighted by a human; chemical taxonomy in the 1960s with analysis of enzymes; cladistics in the 1980s; and crucially molecular taxonomy as DNA sequencing took off in the 1990s. Species are defined by their type and types are kept in herbaria. Herbaria may have been thought peripheral as laboratories became the centres of science, but they remain an important resource.

The systematization of knowledge of the living world is usually referred back to Linnaeus (1707–1778) in the mid eighteenth century; however, he paid scant attention to fungi which began to be properly treated in the nineteenth century. Sir James Smith bought Linnaeus's collection and founded The Linnean Society of London. He published the encyclopaedic *English Botany* with James Sowerby (Smith and Sowerby 1790–1814), which covered the indigenous flora (flowering plants, ferns, mosses, seaweeds, etc.) in thirty-six volumes. Lichens were covered in the supplement, mainly by William Borrer, a friend of William Hooker, the first director of Kew (Hooker 1829–1866). At Oxford there are the earlier collections of Dillenius, which included lichens; probably the first reference collection widely used in England. William Hooker persuaded the Revd M. J. Berkeley to take up the study of fungi (Buczacki 2001) in the 1830s, using the collection Johann Friedrich Klotzsch (1805–1860) had built up when in charge of Hooker's herbarium in Glasgow. Berkeley's *British Fungi* (1836–1843) augmented the information compiled in *English Botany*; and he is considered 'the father' of British mycology. Educated at Rugby, he was a full-time clergyman in Northamptonshire. He worked not only on the British fungal flora but also those from abroad and his collections are rich in type specimens; he also edited the Royal Horticultural Society's Journal from 1866–1877 and was a Fellow of The Royal Society. There is no mycologist in The Royal Society now. He is commemorated at his last parish, Sibbertoft, in Northamptonshire.

In 1756 the British Museum (BM) incorporated Sir Hans Sloane's collection, which included lichens from the end of the seventeenth century. The Department of Natural and Artificial Productions became the Department of Natural History and Modern Curiosities in 1806; and in 1827 the collections of Sir Joseph Banks arrived with Robert Brown, who became the first Keeper of Botany. In contrast to Kew the collections at the BM also covered fossils. The BM purchased the Sowerby fungal models; made by the same James Sowerby (1757–1803) who had published *English Botany*. Sowerby (1795–1815) illustrated the fungi alone in four volumes as *Coloured figures of English fungi*, and showed the models at his home. They became the basis of teaching the public about fungi at the Museum. Research and public education were the purpose of the collections.

The nineteenth century saw the rise of the scientist as the clergy lost their monopoly of higher education; at the beginning of the century there had only been two universities in England, by the end there was a plethora of 'redbrick' universities. The word scientist was first used at a British Association for the Advancement of Science meeting in 1833 and the first BSc awarded in 1858, and by end of the century many scientists had become state funded, which means many scientific funding decisions are made by politicians and civil servants.

Collections

1880–1920

In 1880 Kew employed its first mycologist, Mordecai Cubitt Cooke (1825–1914), a self-taught elementary school teacher and curator of the India Museum. It was in the latter capacity that he came to Kew, with the Indian collections; although Joseph Hooker also considered it useful to have a plant pathologist. Cooke already had connections abroad and knew Saccardo who was working on his *Sylloge*, the first catalogue of the known fungi, and published a list of the larger fungi of Europe with descriptions in Latin for use throughout Europe with the French mycologist Quélet (the co-founder of the world's first mycological society in France). He corresponded with Ravenel in the USA, publishing *Fungi Americani Exsiccati* in 1872–1882. Microscopes had become more easily available and he was a founding member of the Quekett Microscopical Club in 1865. He was quite a character with an extraordinary life (English 1987) but only worked three days a week at Kew before being forced into retirement in 1892.

It was important to disseminate information and Cooke published *Grevillea*, named after a Scottish botanist. He had edited Hardwicke's *Science Gossip* from 1865, an illustrated medium of interchange and gossip for students and lovers of nature, which Massee continued until 1892. Cooke was one of the founders of the British Mycological Society (BMS) in 1896, whose *Transactions* was one of the main sources of information on fungal research; a change of name in 2002 to *Mycological Research,* and from 2010 on to *Fungal Biology*, illustrates the changing emphasis of research over time. Some mycological contributions were published in the *London Journal of Botany* and the more general *Gardeners' Chronicle*. There are many more journals disseminating fungal information now and a good library is an essential adjunct to their study.

A laboratory was key to doing science and in 1876 Kew's first Jodrell Laboratory opened; the building and equipment paid for by Jodrell, a friend of Joseph Hooker, but not salaries for workers. Honorary Keeper from 1896–1902 was Dukinfield Henry Scott (1854–1934) a palaeobotanist and son of Gilbert Scott the architect; his account of fungi in *Structural Botany (Flowerless Plants)* (1907) became a standard student text. George Massee (1850–1917), a protégé of Cooke's and first full-time mycologist at Kew, was also the first mycologist to publish work done in the Jodrell. Massee, related to the famous explorer and botanist Richard Spruce, had gone to art school but he developed into a competent, if eccentric, mycologist publishing his fungus flora (Massee 1892–1895) and a *Text-book of fungi* in 1906. He was the first president of the BMS. The modern Jodrell is home to the current fungarium.

The first academically trained mycologist at Kew was a woman, Elsie Wakefield (1886–1872), who had gone to Somerville College, Oxford. She came in 1910 as assistant to Massee, taking over from him the following year; the appointment was formalized in 1915, and she retired in 1951. In 1920 she went to the West Indies and realized that, because she was a woman, her male temporary replacement would earn more than her. Wakefield was employed as most men would prefer to take a better-paid position in the colonial system; however women were beginning to have a chance to show their aptitude — Helen Gwynne-Vaughan (1879–1967) went to King's College, London and then worked at the British Museum (Natural History) with Blackman, before in 1909 going to Birkbeck, and Lilian Hawker (1908–1991) graduated from

Reading University, worked at Manchester University and Imperial College, London, before going to Bristol University in 1945, becoming Professor in 1965, and, in 1970, the first woman dean of faculty.

Meanwhile, the natural history collections at the BM moved to an extravagantly decorated new building, designed by Alfred Waterhouse, in South Kensington. This became known as the cathedral of science. William Carruthers (1830–1922) was Keeper of Botany from 1871–1895; and also Consultant Botanist to the Royal Agricultural Society. As a palaeobotanist he got involved in the debate about *Prototaxites* Dawson 1859, a giant fossil fungus from the Silurian–Devonian era; a debate continues as to the true nature of this extraordinary fossil. He had a keen interest in the collections and encouraged select people to work on them but he realized by the time he retired no one person could know all the botany collection. One of the primary roles of the Museum was public education so he set about commissioning the writing of guides to various cryptogamic groups; these were the first guides to be published by the Botany Department after its move. Worthington George Smith (1835–1917) a cartoonist and illustrator, archaeologist, plant pathologist and mycologist wrote and illustrated the first fungal guide, based on the Sowerby models. The Revd James Crombie (1830–1908) was employed to work on the lichen collections and create a monograph of the British species, Part I of which was published in 1894 (Crombie 1894). Part II was published with the help of Annie Lorrain Smith, who worked in a semi-official capacity at the Museum (Smith 1911). He also persuaded the Listers, Alfred and his daughter Gulielma, to work on the myxomycetes left to the Museum by Ravenal and others, and to donate their own collections too. The Listers also supported financially the publishing of the *Handbook of Myxomycetes* (Lister 1895, 1925). Alfred Lister was a wine merchant who took up myxomycetes as a hobby and then became a world expert, the sort of person the Museum wanted to encourage. Carruthers was succeeded by George Murray, who had been a student of de Bary in Strasburg, until 1905.

1920–1960

Following the Great War, and at the instigation of the Imperial War Conference, a third collection was established at Kew — the Imperial Bureau of Mycology. The IBM was founded in 1920 to study plant pathology in the Empire and to do systematic research; they published the *Review of Applied Mycology* from 1922. In 1930 they moved into a purpose-built building at Kew. In 1940 they started publishing the *Index of Fungi*; in 1943 the *Dictionary of Fungi*; and in 1947 the *Bibliography of Systematic Mycology*. That year they also started a culture collection. In 1948 they became the Commonwealth Mycological Institute and in 1955 acquired an additional larger building. (Aitchison and Hawksworth 1993). There was now a critical mass of mycologists.

Name change of IBM to IMI

1920–1929	IBM Imperial Bureau of Mycology
1930–1947	IMI Imperial Mycological Institute
1948–1985	CMI Commonwealth Mycological Institute
1986–1990	CMI CAB (Commonwealth Agricultural Bureau) International Mycological Institute
1990–	IMI International Mycological Institute

At the NHM from 1930 to 1950 a well-respected mycologist, John Ramsbottom (1885–1974) was Keeper of Botany. He worked at the Museum for forty years and his book *Mushrooms and Toadstools,* No.7 in the New Naturalist series, is a classic (Ramsbottom 1953). In 1953 it was thought there were only about 100,000 species of fungi whilst now it is thought there are a million or more. He celebrated the new interest in fungi after the Second World War when penicillin (derived from the mould *Penicillium*) was invaluable and there was a new interest in wild edible fungi as well as food involving yeasts. Knowledge of fungi had grown since the *Chaos* of Linnaeus but it was not until 1787 that Hedwig carried out the first proper microscopical analysis of the structure of fungi in twenty cup-shaped ascomycetes. He pointed out that a lesson is to be learnt from the blind faith in H. F. Link's 1809 assertion that all spores were in asci which was accepted until 1836 when Ascherson showed some were on basidia. Finally, in 1838 Berkeley realized Link was wrong. This emphasizes the need to question the accepted.

Peter James was employed as a full-time lichenologist by the Museum in 1955, encouraging the study of lichens. He was one of the founding members of the British Lichen Society (BLS) in 1958 and the Museum became a dynamic centre of lichenology. The distinction between fungi and lichens has always been a difficult one as lichens are a symbiotic relationship between fungi (mostly ascomycetes) and green algae and/or cyanobacteria. At Kew, Dr R. W. G. Dennis specialized in ascomycetes and published *British cup fungi and their allies* (Dennis 1960) which was enlarged and revised in 1968 to *British Ascomycetes*, and again in 1978 and 1981, and remains the basic text for people studying ascomyetes, a group less studied than basidiomycetes. He also published extensively on British fungi and compiled records from the South-East and the Hebrides.

1961–2000

In 1961 the Morton Agreement meant that all the non-lichenized fungal collections went to Kew and the lichens to the NHM. Dr Dennis managed to keep a reference collection of lichens at Kew. James retired in 1990 by which time the centre of British lichenology had moved to Edinburgh, where Dr Brian Coppins worked; however thanks to cooperation between the two centres, and talented amateurs, the 'British Lichen Flora' (Purvis et al. 1992) was published.

The amateur is usually drawn to the larger agarics and their interest was encouraged by Dr Derek Reid, Assistant Keeper at Kew who helped edit Roger Phillips's photographic book (Phillips 1981). He also taught an extramural course which helped many competent amateurs. Nick Legon and Alick Henrici, who worked on the *Checklist of the British and Irish Basidiomycota* (Legon and Henrici 2005), were two he encouraged. The relationship between the amateur, or citizen scientist as they are now called, and the professional, is an important one for mycology. Reid's son searched the journals for lichens for the excellent history of British lichenology (Hawksworth and Seaward 1977). Dr David Pegler, another agaricologist, took over from Reid and brought in Herbtrack, a database system specific to the mycological collections now available online (http://apps.kew.org/herbtrack/search). He also organized the XI Congress of European Mycologists at Kew in 1992 at which Dr David Minter, IMI, started the idea of a European-wide organization of mycologists, now the European Mycological Association. Professor Paul Bridge from

Birkbeck was associated with the Kew mycology section, bringing students and new laboratory techniques to the section.

In 1996 the centenary of the BMS was celebrated with a series of events around the country, but 1998 was a sad year for mycology as both Pegler and Roy Watling, of Edinburgh Botanic Garden, retired and their posts were frozen. David Hawksworth had taken early retirement from the IMI the Christmas before. In 1986 the CMI became the International Mycological Institute (IMI) within CABI (CABI International). The IMI moved to Egham in 1992 — naming their buildings after twentieth-century mycologists Ainsworth, Bisby, Butler, Mason and Wiltshire (Aitchison and Hawksworth 1993); having sold the larger building (now a preparatory school). Kew mycology moved, in 1994, into IMI's old building which was, in 1930, the first building specifically for mycology. This was pulled down in 2006 when the main herbarium and library was extended with 'Wing E', and the mycological collections went to the basement of the new Wolfson Wing of the Jodrell Laboratory.

Twenty-first century

IMI now does identifications using DNA and chemistry and has retained the culture collection. The NHM continues to change and currently there is no lichen section as such, but Dr Holger Thues, curator, oversaw the databasing of over two thousand backlog boxes and continues to help visitors as well as carrying out some research into the Verrucariaceae. Dr Cécile Gueidin also carries out research on Verrucariaceae and other pyrenomycetes.

At Kew, Dr Martin Bidartondo arrived at the Jodrell in 2004, joint with Imperial College, specializing in molecular mycorrhizal ecology. The IMI collection came to Kew in 2009, making the fungarium the biggest in the world. By this time most of the IMI mycologists had retired but two came to Kew — Dr Paul Kirk, who manages *Index Fungorum* and other databases, and Dr Paul Cannon. Dr Bryn Dentinger arrived in 2010, taking over from Dr Brian Spooner in 2012, a century since the first academically trained mycologist had been appointed as Head of Mycology at Kew. Kew also added a Fungal Conservationist in 2010, Dr Martyn Ainsworth, and will welcome a new Senior Researcher, Dr Ester Gaya, another molecular-focused mycologist with taxonomic expertise in the Teloschistales. Together, they represent the start of a new era where the DNA analyser has much greater emphasis than the microscope as a tool. Mycology is an international field of study and we are lucky to recruit such a diverse selection of mycologists from around the world.

The history of mycology and British mycologists up to the last century has been documented by Ainsworth (1976, 1996). The profile of mycology is still low but there is increasing interest. Field knowledge and a good reference collection will always be important to fulfil the role of understanding the ever evolving funga of Britain.

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Book review

Grey daggers and minotaurs in Greenwich Park. Memories of a London schoolboy naturalist in the 1940s. John F. Burton. Clio Publishing. 2014. xxxvii, 398 pp. Softback, 215 × 155 mm. £16.50. ISBN 978 1 78280 206 8.

John F. Burton, long-standing member of the LNHS, has had a long, fruitful and productive life in the world of natural history. He was involved from an early age with the RSPB, then in 1948 he joined the Entomology Department of the Natural History Museum. In 1953 he was appointed Assistant Secretary of the BTO, and then, in 1960 he joined the BBC Natural History Unit where he became Sound and Film Librarian. He retired from the BBC in 1988.

This book records his earliest involvement with nature and is divided into six main chapters, from 1940 (when he was nine) to 1943, from 1943 to 1945, then 1946, two chapters on 1947, one on the cruel winter and one on the following summer, and a final chapter on 1948. The family moved from Lewisham to Mottingham, then on the very edge of London, and from there to Charlton. The chapters intersperse narrative descriptions of the author's natural history undertakings with extracts from his field notes and diaries. London naturalists will recognize many of the sites in southeast London and the adjoining areas of Kent that he describes. Many others, however, are now changed beyond all recognition, the post-World War II expansion of London rivalling that of the Victorian era in changing open country to bricks and mortar.

He says of the *London Bird Report* 'I well remember the thrill of pleasure I had felt when the latter slim green publication first came into my hands in April 1947 and I saw so many of my bird sightings for 1946 published, with my initials in brackets after each record'. The extensive extracts from his notes show the richness of the underlying observations of which only the bare details appear in the *LBR*, and are a useful reminder of the importance of field notes. It was in 1946 that he first had the use of a pair of binoculars, lent to him by Frank Holroyde when he joined the LNHS. His observations are not limited to birds, however: flowers, insects, amphibians and mammals, all came within his view. Birds were his first interest, but 'I decided it would be wise to build up as sound and as wide a general background knowledge of the natural world as possible'.

The book includes a useful thirty-three page 'Who's Who' of his contacts during the years covered by the book, who are now deceased, many of whose names will be known to LNHS members. The book is illustrated by the author's own photographs and drawings. A very worthwhile book of record.

David W. Allen

Survey of Bookham Common

SEVENTY-FIRST YEAR

Progress Report for 2012

Introduction (Stuart Cole, Chairman, Bookham Common Survey)

This year we had some worrying news concerning the tenancy of Merritt's Cottage and the future of the LNHS field station, 'the hut' which stands in the cottage grounds. The National Trust, owners of Bookham Commons, have adopted a policy of evicting their live-in staff in order to generate money through letting out the properties at commercial rents. This will include Ian Swinney, the resident ranger at Bookham who is the tenant of Merritt's Cottage. As the LNHS hut is situated in the ranger's garden it is likely that potential tenants will not want LNHS members invading their property and the NT are likely to require us to remove it.

Ian Swinney has always been a good host to the LNHS and we have maintained a mutually beneficial working relationship with him. Ian acknowledges the value of the species survey and advice of the LNHS Bookham team for his management of the Common's habitats in order to maximize biodiversity.

Apart from the difficulties that Ian will face on losing his home, the absence of a ranger on site is likely to make the Common more vulnerable to misuse. Alan Prowse and I have appealed to the Trust to make an exception to their policy in view of Bookham Common's status as an SSSI and as the subject of the long-running LNHS survey. Local Bookham residents too are concerned about the possible impact that the removal of the resident ranger will have on the welfare of the Common and have protested to the NT.

At the time of writing we had some good news that Ian had been given a reprieve and the National Trust is deferring the move until March 2017, so the hut should be safe for another few years. In the meantime we will continue to press the Trust to let Ian stay.

In April, Max Barclay and colleagues from the Entomology Department at the Natural History Museum with assistance from LNHS members set up Lindgren beetle traps at Bookham Common for the second year running. Once again these were suspended from branches ten to fifteen feet from the ground in mature trees along Common Road; three in oak trees and the fourth in a pine. In addition Max lent me a further Lindgren trap which I placed in an oak at the edge of a paddock near Merritt's Cottage. The Canadian-made traps baited with specific pheromones were designed to catch bark beetles in large numbers as a means of reducing them in plantations. We have found that the traps catch many species of insects of various orders without using any bait. The bulk of the catch from these traps in 2011 and 2012 still awaits identification at the Museum, but among beetles (including bark beetles) so far

identified are some scarce and local species including: *Villeius dilitatus*, *Prionychus ater*, *Melandrya caraboides*, *Hylocoetus dermestoides* and *Stictoleptura scuttelata*. Insects of other orders taken in the traps include craneflies and hoverflies, snakeflies *Raphidia* sp.; scorpionflies *Panorpa* sp., moths, parasitic Hymenoptera, caddisflies, psocids, thrips and leafhoppers, as well as spiders and opiliones.

Plant galls

Tommy Root, the Society's gall recorder, carried out monthly surveys at Bookham from June to October. This was his first year at the site and he found the number of gall species and their composition to be interesting. He recorded a total of fifty-two gall species comprised of: 13 mite galls, 11 Diptera, 2 Hemiptera, 19 Hymenoptera (15 wasp on *Quercus*, 2 wasp on *Rosa*, 2 sawfly on *Salix*), 6 fungal, 1 viral/phytoplasma. Particular highlights, all new to him, were:

Bauhinus cordae – a smut fungus on water pepper

Dasineura hygrophila – a midge gall on fen bedstraw flower bud

Andricus quercusramuli (sexual phase) – cotton wool gall, wasp induced on *Quercus robur*.

In addition he found an old specimen of the hedgehog gall *Andricus lucidus*, a species new to Britain in 2000, and now common in NW London, but the age of the single specimen suggests it has not established at Bookham.

Mammals

Alison Fure has passed me the following information from her mammal recording notes at Bookham for 2012. Just one hazel dormouse *Muscardinus avellanarius* was found occupying one of the nestboxes. This was in Hundred Pound Bridge Wood near to Chasemoor Farm. There were no signs of occupation in the boxes at Kelsey's Wood probably due to the site being excessively wet. A total of fifteen wood mice *Apodemus sylvaticus* were found in different types of winter and breeding nests with three individuals in one nest box. There were signs of weasel predation in two of the nest boxes. Two common shrews *Sorex araneus* were occupying an old blue tit nest. There were signs of badger foraging and latrines in Hundred Pound Bridge Wood. (In the course of her mammal surveying, Alison observed the following birds mainly around Hundred Pound Bridge Wood: woodcock, tawny owl, lesser spotted woodpecker and bullfinch).

Birds (Alan D. Prowse)

The British Trust for Ornithology had a national survey of nightingales this year. Ruth Iredale put in tremendous energy and effort on the Common and several nearby tetrads. Because of this effort seventeen territories were mapped on Central, Isle of Wight, and Western Plains. Several of these were established quite late in the season, in places the species had not used previously. A middle-of-the night survey suggested that the males in two of these territories were not paired, but the total is a record for the Common for a species which is decreasing elsewhere. Nightingales are occurring in Surrey in good numbers only where conservation effort is made to provide habitat for them.

Wood ducks *Aix sponsa* produced an unexpected series of records. Richard Kennedy reported two males and a female on 26 January with a male

mandarin, with photographs, and a male and female wood duck on 28 January. Ruth Iredale found a male and female on 14 October and a female on 28 November. This was followed by a pale leucistic female in the spring of 2013. This species, from escapes, is beginning to establish occasional feral breeding in the UK and records are being kept by the Rare Birds Breeding Panel.

Single firecrests were recorded on 19 February (E. Hare) and 17 December (Surrey Bird Club). A kingfisher was found by Ruth Iredale on 22 July. Hawfinches were seen in January, February, March, and December, singly except for two on 9 March.

On the ponds in the breeding season Canada geese raised a brood but the mute swans were unsuccessful. A pair of tufted ducks was present in the breeding season but no young seen. Little grebes were double-brooded on several of the ponds. A hobby was seen occasionally, the third year in succession that the species has occurred. No doubt it was attracted by the increase in the openness of the ponds and the Odonata present, but the hobby could equally well be seen feeding over the oak canopy. Occasional red kites flew overhead during the year, and there were resident buzzards and sparrowhawks on the Common and in the surrounding woods.

The heronry had thirteen occupied nests but one of these seemed deserted at the time of inspection despite eggshell remains below it. This nest was the only one in what was previously the main group. The rest of the occupied nests were in a compact group near the Isle of Wight Pond. The heronry seems to be in slow decline. This is the only heronry on land with public access in Surrey, and the increase in dog walkers using every conceivable path (and making new ones) does not bode well for the future.

On the plains the willow warbler was present in very small numbers. However, whitethroats were commoner than usual. Seven waxwings were reported (SBC) on 27 November.

Invertebrate Field Study Day, 14 July 2012 (Neil Anderson)

Following on from the wettest April on record, a mixed May, the wettest June and also a pretty wet July up to the day of this meeting, including heavy rain the previous evening, the omens were not good. As well as high rainfall temperatures have often been low and sunshine well below average.

We started this meeting with eleven people in dry (apart from underfoot!) conditions with a little blue sky but within thirty minutes or so we were treated to some torrential rain and so headed for the hut. Following an early lunch conditions improved with even some brief sunshine and warmth before dark cloud set in. During this post-lunch window of reasonable weather we completed a circuit of the Isle of Wight Pond and then Stuart Cole and Steve Mellor took us to the plantation to look at common spotted orchids and their hybrid with southern marsh orchid. Common valerian was looking very lush and in peak condition.

Within the plantation we saw a male black-tailed skimmer flying around and a teneral common darter was found at the base of some grass before eventually flying off. The only other Odonata seen were several common blue damselflies in the grass.

Normally on this annual Bookham study day in July we expect to see around sixteen species of butterfly. Today we managed eight species, all singletons apart from two species: ringlet and meadow browns (up to ten of each) which flew even in light rain. The other species recorded were a green-veined white at

bramble flowers, a red admiral examining nettles for ovipositing; males of large and small skipper and two of the specialities: a white admiral which posed on a bracken frond and a brief flight view of a silver-washed fritillary. The ranger, Ian Swinney, said sightings of the last two species have been few so far in this dire season.

Moths encountered were common carpet, shaded broad-bar, a fine settled blood-vein, the migrant silver Y and the micro, *Celypha lacuana*.

Most orthopterans hadn't matured and we encountered nymphs of speckled and dark bush-cricket as well as long-winged conehead. Around Isle of Wight Pond the regular chrysomelids *Chrysolina herbacea* and *C. polita* were found including a copulating pair of the latter species. Also *Cassida viridis* was found on gipsywort here.

Four common lizards were seen optimistically basking near Merritt's Cottage; two on a large log and the other two in the vegetation. A large slow worm was found below a piece of fallen bark and several age-group common frogs were also recorded.

Chiffchaffs and blackcaps were still singing and small family groups of goldfinches and greenfinches were seen. Bullfinch and kestrel (possibly two individuals) were also noted.

Despite the worst conditions I've encountered here, a range of fauna and flora was enjoyed by the group and some genial company too!

Orthoptera Study Day, 11 August 2012 (Sarah Barnes)

The following species were seen: speckled bush-cricket *Leptophyes punctatissima*, oak bush-cricket *Meconema thalassinum*, Roesel's bush-cricket *Metrioptera roeseli*, long-winged conehead *Conocephalus discolor*, dark bush-cricket *Pholidoptera griseoaptera*, meadow grasshopper *Chorthippus parallelus*, field grasshopper *Chorthippus brunneus* and common green grasshopper *Omocestus viridulus*. Although the weather was mild, the day did not produce rufous grasshopper *Gomphocerus rufus*, despite a long search, the first time in six years that it has not been found, and neither was short-winged conehead *Conocephalus dorsalis* as, due to high water level at the Isle of Wight pond, we were unable to search for it.

Contributors' addresses

Neil Anderson, 52 Beechwood Avenue, Greenford, Middlesex UB6 9VB.

Sarah Barnes, 33 Tavern Close, Carshalton, Surrey SM5 1JE.

Stuart Cole, 21 Wensleydale Gardens, Hampton, Middlesex, TW12 2LU.

Dr Alan Prowse, 46 Badingham Drive, Leatherhead, Surrey KT22 9HA.

Obituary

ERIC HOWARD GILLHAM, 1914–2012

While Eric Gillham's name is forever associated not primarily with the London area, but with the North Kent Marshes, it was in no small measure as a result of the book *The Birds of the North Kent Marshes* (1950), written jointly with Dick Homes (obituary, *LN* **58**, 1979), that so many London birders visited and became familiar with the marshes. Indeed it is now so well established as a prime birding spot, that many visitors are perhaps not even aware of Gillham and Homes' contribution to putting it on the ornithological map. But Eric made more obviously direct contributions to London's ornithology, notably with his book on the tufted duck in St James's Park (*Tufted Ducks in a Royal Park*, 1987) and on which he lectured to the LNHS. This was a good example of making use of potentially wasted time, for the park was on Eric's route to and from work and he used that time to good effect, pulling the results together in a book closely modelled on Al Hochbaum's study of the canvasback in the United States (*The Canvasback on a Prairie Marsh*, 1944, 1959).

Eric was born in Addiscombe on 16 November 1914. He recalled that the sight of a song thrush's nest with eggs at the age of eight set him off on egg collecting, but after a few years he was persuaded by G. W. Collett to give up collecting in favour of studying the birds. He did so and with Collett and, later, after joining the LNHS in 1933, on its outings, he became familiar with the birds of the Surrey Heaths. Educated at Whitgift School, he joined his father's business on leaving and just before the Second World War he enlisted in the territorial army. During the war he spent much time in North Africa and took whatever opportunities came his way to familiarize himself with new species. He had become familiar with north Kent before the war while staying at his mother's holiday house at Tankerton, and later, when he and a friend rented a cottage on Eastchurch cliffs. After the war he planned a book on the marshes,

Eric Gillham on the North Kent Marshes with his trusty Broadhurst Clarkson telescope.

but then discovered that R. C. (Dick) Homes had the same idea. The jointly written book followed in 1950. It broke completely new ground for a regional avifauna by setting the birds in their physical environment. It formed the template for every county avifauna that has so far followed. Eric was a driving force in the formation, at about that time, of the Kent Ornithological Society, acknowledging subsequently that it was modelled on the LNHS. He edited the first *Kent Bird Report*, for 1952, and remained as sole editor for the next six years.

Eric did not always conceal his views and described his relations with the establishment as 'not cosy'. He could be a harsh and very direct critic of descriptions of rarities and of draft manuscripts, yet his criticisms were always well founded and not lightly to be ignored. But equally, he and his wife Joan were the most hospitable of hosts. Having lived in the London area for most of his life, he moved to Lydd in 1985 and finally to Suffolk in 1997 to be near his family and where, with his son Barry, he conducted detailed studies of hybrid ducks. He died there aged 97 on 27 March 2012. He may not be well remembered by younger generations of London's birders, but whether they are aware of it or not, those who bird in north Kent will forever be in the debt of Eric Gillham and Dick Homes.

Paul Brisley very kindly provided much of the information on which this obituary is based.

PETER OLIVER

Obituary

JOYCE MARY POPE, 1927–2013

Joyce Pope died on the 9 August 2013, and although many present-day members of the London Natural History Society will not have known her, from the late 1950s to the 1980s, when she worked in the Natural History Museum as Guide Lecturer, she also lectured to the Society, either formally or at the Museum on Saturdays. She was a member of the LNHS during that period.

Joyce was born in Valparaiso, Chile on 23 September 1927 where her father Greg Andrews was working as a foreman in the gasworks. It was there that her interests in natural history were kindled when as a small child she already had chickens as pets when the family returned to England by sea in 1930, the six-week journey being via the Panama Canal.

Joyce went to school in Wimbledon and had vivid memories of sitting her School Certificate in 1944 in the air raid shelters in the school grounds. Luckily she passed and was the first person in the family to go to university. She took her degree in geography at Reading where she also studied archaeology with Sir Mortimer Wheeler.

Joyce worked initially at Chester Museum where she developed her love of natural history, but in November 1950 she joined the staff of the then Geology Department at the British Museum (Natural History) as a Temporary Scientific Assistant. In 1954 she transferred to the Exhibition Section as an Assistant Experimental Officer (Guide Lecturer), and in February 1958 was promoted to Experimental Officer. Joyce retired from the Museum in 1987 as a Senior Lecturer, having given daily afternoon lectures or demonstrations in either the Lecture Hall or in the galleries.

Throughout her Museum career Joyce was a persuasive voice for natural history and was particularly good in engaging with young people, especially on Saturday mornings at the Museum's Children's Centre, many of them from urban schools who would have had little or no previous knowledge of wildlife. Never one to slow down, Joyce also gave evening lectures to the Workers' Educational Association, but unlike the norm, her attendances increased as the terms went on!


Joyce in her museum days: left, wearing a live lizard as a brooch, and right, lecturing.

In August 1956 Joyce Andrews married Museum coleopterist R. D. (Bob) Pope (1928–2013) and in 1961 they moved to Slinfold in Sussex where they spent the rest of their lives. Joyce and Bob had no children but their house was always full of life, often of the small furry kind. On the Pope 'farm' things were larger. Joyce regularly took her pet llamas into the village for shopping trips. She also had Dobermanns, and after training them in obedience and working trials she won rosettes for show classes. At one time she had two tawny owls, Twit and Twoo, who had been rescued as fledglings and were unable to feed themselves, so Joyce had to get white mice from the market. Another of Joyce's passions was riding, so she became a member at Hickstead and eventually owned her own horse, Barney, a chestnut ex-racehorse. And, of course, she had chickens again, and Museum colleagues would be frequent recipients of eggs! Joyce's appetite for travel after retirement took her to both the Arctic and Antarctic on several occasions.

During her busy life, only a sample of which is related here, Joyce managed to write over fifty books for children, and colleagues have found one or more in the most unexpected small libraries or study centres, whilst her niece Philippa, who taught in three schools, found sets of Joyce's books in each of them. On one occasion, whilst Joyce was returning home from the Museum on the 6.18 from Victoria to Horsham, and busily writing in longhand, a snake escaped from her basket much to the puzzlement of the man sitting opposite who tactfully wondered what was rubbing his leg!

For someone whose professional remit was to cover both the earth and life sciences, her depth of knowledge was impressive and her enthusiasm never waned. She will be missed by many and forgotten by none who knew her.

Our condolences go to Joyce's sisters Beryl and Hazel, to her nieces Philippa and Helen, and to her great-niece Alexandra. My special thanks go to Beryl and Philippa, and to Museum colleagues Paul Cooper, Claire Mellish, Noel Morris and Chris Stringer for sharing their memories of Joyce.

KEITH H. HYATT

Obituary

Photo: K. H. Hyatt

Raymond and Joy Cordero leaving St Agnes, Isles of Scilly, 1 November 1958.

RAYMOND PHILIP CORDERO, 1928–2013

Raymond Cordero will be best remembered by the London Natural History Society for the superb film 'London's Birds' that he and fellow cameraman Bill Park (obituary, *LN* **83**, 2004) produced for the Society. It was premiered at St Pancras Town Hall on 26 March 1963 and was shown twice nightly for four successive nights, with two special matinees for schoolchildren. About 4,000 tickets were sold. We also produced an illustrated glossy quarto programme booklet describing the making of the film and generally introducing natural history in London. The film continued to be a great success and was shown widely in and beyond London.

Raymond joined the LNHS in 1952 and was soon on the Ornithology Section Committee. In 1956 he took over editorship of the Section's *Bulletin*, producing a new-style attractive, topical read, at first quarterly then two-monthly. Raymond became secretary of the Ornithology Section in 1961 for a couple of years, then assistant secretary, but stepped down from that post to continue the onerous task of editing the film.

Raymond was born in Croydon on 6 January 1928 and was educated at Whitgift School. After completing his National Service with the Army Intelligence Corps in 1947 he joined the *Metal Bulletin* in London as a technical journalist, becoming Editorial Director. This took him to many parts of the world where he was able to add to his bird knowledge. In the early 1960s Raymond edited the 'News and Comment' section of *British Birds*.

In this country he regularly visited bird observatories, notably Dungeness where he met his wife Joy. Together they visited especially Norfolk, Skokholm, Pagham Harbour, Minsmere, the Cairngorms and the Isles of Scilly. It was

Photo: Leslie Baker

Raymond Cordero filming in Lincoln's Inn Fields.

whilst staying at the St Agnes Bird Observatory on Scilly in 1958 that Raymond did preliminary filming with his new equipment before embarking on 'London's Birds'.

Always a conservationist, Raymond mourned the decline on our bird species whilst welcoming new ones. In consultation with the Kent Wildlife Trust, Joy and Raymond gradually turned their ancient woodland and farmland on the Kent/Sussex border, which incorporated a large badger sett, into a private nature reserve. After retirement Raymond studied butterflies and dragonflies in particular and expended much energy in producing woodland glades for butterflies. It was a happy day when a purple emperor showed up!

Raymond's other interests were literature and music, especially opera. A knowledgeable book-collector, he amassed a themed library on many subjects. He was a quiet, friendly, well-loved character with a subtle wit, always reliable for a 'quote', or the answer for a crossword, or the identification of some 'weird' insect.

Raymond will be greatly missed by his widow Joy, their daughter Jane and son Philip, their four grandchildren and many friends, to all of whom we extend our sincere condolences. Special thanks to Judy ffennell for contributing memories of Raymond.

KEITH H. HYATT

Obituary

KENNETH HOWARD PALMER, 1930–2012

Ken Palmer was a member of the London Natural History Society for well over fifty years, having joined in 1950, and was a regular contributor of ornithological records from the Kent sector for much of that time. For ten years, from 1977 to 1987, he was chairman of the Ornithology Section's Research Sub-committee and also served on the Section Committee from 1981 to 1985.

Ken was born in Beckenham, Kent on 3 April 1930 and educated at Tonbridge School along with his brother, Rex. There he concentrated on arts subjects, but after National Service in the Royal Navy he changed direction and took an eighteen-month science course as a prelude to going to Imperial College, London, and obtaining a B.Sc. in chemical engineering. His subsequent career was spent in the oil industry, working for Esso, initially at its refinery in Fawley, on the west side of Southampton Water, and, for an enthusiastic birdwatcher, conveniently placed for the New Forest.

One species studied by Ken and others in the New Forest at that time was the firecrest, with Ken recording up to six singing males at one locality in 1962 and being particularly intrigued by hearing and seeing a male firecrest singing both firecrest and goldcrest songs, and for which he devised a code for transcribing the song sequences which were then reproduced in a paper by M. C. Adams published in *British Birds* (**LIX**, 1966).

After six years at Fawley, Ken returned to London for a time before a further career move took him to the United States for eighteen months during 1965 to 1966, when he moved back to London, settling in Chislehurst, Kent, with the extensive woodlands of Petts Wood and Chislehurst almost on his doorstep and the North Kent marshes within easy reach. Meanwhile his work as a process engineer and planning analyst in the early application of linear programming

for Esso's refineries at Fawley and Milford Haven led to the publication in 1984 of *A Model – Management Framework for Mathematical Programming*, with Ken as principal author.

As chairman of the Society's Ornithology Section's Research Sub-committee, Ken reinstated the system of 10-km square organizers, developed originally for London's first Breeding Bird Atlas, to help in mobilizing local observers to undertake future surveys. One such was a study of the breeding season status of grey wagtails in the London Area over three years, 1979–1981, a major undertaking when observers were being asked to survey over 1,700 km of London's waterways. Overall 63 per cent was covered and 184 separate grey wagtail sites located. The results were published by Ken in the *London Bird Report* **47** (1983). He followed this with a survey of breeding or potential breeding birds in major woodlands throughout the London Area, the results being published in *LBR* **52** (1988). To get this survey under way, he settled on ten hectares as a minimum size for a major woodland and then catalogued 363 sites. It is a measure of his thoroughness, tenacity and powers of persuasion that 150 observers participated and as many as 312 of those sites were visited. Altogether seventy-two bird species were recorded, excluding eleven of the most common species that were assumed to be present in all woods.

Ken also produced *The Birds of Petts Wood: a Checklist 1963–1978*, published by the local National Trust Committee, which owns considerable areas of the woodland, and he became a conservator for the Chislehurst Commons and a member of the local National Trust Committee of Petts Wood and Hawkswood, serving as chairman for six years up to his retirement at the age of seventy. His local patch was Hoblingwell Wood which he visited with great regularity for many years. As well as everyday species, it attracted passage migrants and, on one occasion, a well-watched marsh warbler sang for a few days. As a variation from this dedicated patch work, he would occasionally get together with his brother and the two of them take off on a twenty-four-hour bird count.

After the great storm of October 1987 which badly affected the Petts Wood and Chislehurst woodlands, Ken carried out a one-man survey of the thirty-four hectares of Willett Memorial Wood, counting every tree above a certain threshold size and noting whether they were fallen, damaged or still standing. In total 18,507 trees of thirty-four species were counted of which 31 per cent had been blown down by the storm. This task was carried out for the National Trust for the local management committee and the results were reproduced in *The London Naturalist* **69** (1990).

Many LNHS members will have fond memories of Ken's regular field meeting trips to the North Kent marshes from Cliffe to the Isle of Grain and covering a period of twenty years up to 2002 as well as trips to the east end of Sheppey around Harty Ferry and Shellness. These trips, with a convoy of cars setting out from Strood station, were always meticulously researched with reconnaissance visits and tips from friends living in the area and geared to the optimum state of the tide on the Thames. A summary of the species seen on the North Kent marshes trips is published in *LBR* **76** (2013), and a full list will appear on the Society's website. He also found time to lead walks around the local area and gave talks to local societies, which led to him being awarded a Bromley and Countryside Award.

Ken's interests extended beyond birds and trees and for thirty-two years he was chairman of the Old Bexley Music Society, thereafter becoming life

president. Another of his publications was a brief history of that Society's first fifty years. In fact, the Palmers' was a musical household as not only did he play the piano, but his wife, Gill, was trained as a teacher and pianist herself at the Royal Academy of Music. She and Ken met on their journeys to their respective colleges and were married in 1955.

Sadly, Ken suffered a severe stroke in May 2007 which left him incapacitated and in need of continuous care, a devastating situation for Gill and their daughter and son, Marian and Colin. After five years of professional care, he died on 17 August 2012.

Gill and his children have lost a devoted family man who shared their interests, just as they, to some extent, shared his passion for birds. In fact his daughter, who is currently honorary treasurer of her local branch of the Hampshire Wildlife Trust, claimed, as she once came to a quick halt to look at a red kite, that one thing she learnt from her father was how to birdwatch and drive at the same time. Gill, however, never fully appreciated the need to count birds on a cold Norfolk coast at the beginning of January when they had already counted the things at the end of December, but of course, with Ken's careful note-taking, the numbers had to go on the list for both the old year and the new. For the rest of us, his highly enjoyable field trips, his wide knowledge, scholarly thoughtfulness and his enthusiasm are greatly missed.

DAVID MONTIER

Book review

Britain's day-flying moths. A field guide to the day-flying moths of Britain and Ireland. David Newland, Robert Still and Andy Swash. 224 pp, softback with transparent plastic dust-jacket. ISBN 978 0 691 15832 7, Princeton University Press, 2013. £17.95 plus postage and packing.

My library shelves, not to mention my bank balance, are groaning these days under the weight of all the moth books that seem to be appearing. Do we really need another moth book? My view is 'yes' provided that two primary conditions are met. First, the subject matter ought to be presented from a new or otherwise interesting angle; second, because there are already so many quality works available the scientific standard and aesthetic quality both need to be exceptionally high.

With regard to the first, I suggest that the present work does meet this condition since it targets those people, presumably non-collectors, who prefer to do their moth watching by daylight. However, the interpretation of the term 'day-flying' has evidently been treated as *sensu lato* and a goodly number of the 155 included species are actually nocturnal beasts that may, with varying degrees of likelihood, be disturbed from vegetation by day. Some hawk-moths are included — now there's a surprise; perhaps the space used by some of these may have been better used in presenting more of the grass moths (Crambidae) or even showing us *Pyrausta ostrinalis* alongside the excellent images of *P. aurata* and *P. purpuralis*. It is pleasing to see, though, that micros have not been overlooked, even if proportionately under-represented in the photographs.

In terms of scientific content and accuracy it is hard to find particular fault, although there is a rather suspicious character purporting to be a latticed heath *Chiasmia clathrata* on page 109 that would give any self-respecting female common heath *Ematurga atomaria* a run for its money! The text that accompanies the illustrations is fairly good at noting the similar species that might be encountered, though I am not sure of the reasons for or wisdom of including the satyr pug *Eupithecia satyrata* as the only 'brown' pug — especially since it sits opposite a strikingy different-looking marsh pug *E. pygmaeata*, which is stated to be similar! I suspect that County Moth Recorders may see a sudden surge in *satyrata* reports in 2014. *Photedes captiuncula* is shown opposite two forms of *Mesoligia furuncula* and the only comment made is that the former is smaller and lacks the 'cloak' that is usually evident in the latter. Given the clear inference from the two pictures that *furuncula* is variable, I feel I might be forgiven for seeing something resembling a cloak in the *captiuncula* image whilst, as for size, one goes up to 9 mm and the other starts at 10 mm! I cannot help thinking that additional text might have been helpful. The distribution data seem to be up-to-date for the species checked. For example, Jersey tiger *Euplagia quadripunctaria* L. is shown for London and Hertfordshire to which it has spread and become resident in the last three or four years, although the other new and even more abundant resident in this area, the toadflax brocade *Calophasia lunula* is not afforded an entry in the pages in spite of being, in season, easily disturbed from the foodplant at most post-industrial sites, overgrown cemeteries and even domestic gardens throughout London and along the Thames into Essex. The six-belted clearwing *Bembecia ichneumoniformis*, which is abundant on many such sites is included, though the alternative foodplant of *Lotus tenuifolia* upon which it thrives at many East London sites is not listed.

This book does not set out to form a comprehensive guide to all the moth species, but is likely to prove an invaluable field guide for birdwatchers, general naturalists, wildlife photographers and others for whom moths are not the primary interest, as well as for people who simply love moths. It is far and away the best of the books available that I would be likely to recommend to complete beginners and hopefully it will encourage some of its users to look beyond the sunset, join their county moth group and discover the vast wealth of nocturnal species — many of which are just as photogenic!

COLIN W. PLANT

Obituary

DEREK WILLIAM YALDEN, 1940–2013

Derek and I met at school in the late 1950s and our career pathways were closely linked for decades. In 1960 he met W. G. ('Bunny') Teagle, mammal recorder for the London Natural History Society, a great inspiration to us both. Bunny was attempting to survey London's mammals, especially badgers, and we took up the challenge, spurred on by blank squares on his maps. Fieldwork in Surrey also led to the discovery of a colony of noisy frogs in the deep water of Black Pond on Esher Common, and Derek resolved to catch one for identification. He did so despite cold water and his inability to swim, an exploit that led to publication of his first paper entitled 'Edible frogs at Esher' in the *British Journal of Herpetology* (Yalden and Morris 1961), written whilst he was still a student. He attended a field course and learned about small mammal trapping, which later led to his apprehension by the police, baffled by the sight of someone wearing bicycle clips, thick gloves and short-sleeved shirt leaving a copse long after dark.

Derek graduated from University College London with a First Class degree in 1965. The UCL syllabus centred on morphology, taxonomy and palaeontology, which underpinned Derek's academic life. However, he was equally absorbed in field studies, of mammals especially. Inspired by Bunny Teagle's mammal surveys in London, he helped to publish Britain's first National Badger Survey and made major contributions to the first *Atlas of British Mammals* (Arnold 1993), a new version of which was Derek's project in hand when he died.

Transferring to Royal Holloway College (University of London), Derek embarked upon a PhD examining the functional anatomy of the mammalian wrist. RHC was still an all-female college for undergraduates, but they failed to distract significantly from his studies. He joined the LNHS in 1962, remained a member for fifty years, and served briefly as its reptile and amphibian recorder. He joined The Mammal Society too, attending his first Annual Conference in 1963, and soon became involved with its Bat Group. By then I had passed my

driving test and got a car, so we could expand operations to include studies of hibernating bats in some of Surrey's old stone mines and make inspirational visits to bat locations further away. We jointly published *The Lives of Bats* in 1975 and also began contributing to The Mammal Society's technical publications with Derek's *Owl Pellet Analysis* in 1977 and *Identification of British Bats* in 1985. We were both awarded the Society's Silver Medal at the same time in 1989, probably because nobody was quite sure which of us had done what!

Derek contributed to three editions of The Mammal Society's *Handbook of British Mammals* (1964, 1977, 1991) and facilitated the massive task of completing its fourth edition in 2008. He also served as editor of *Mammal Review* for twenty-two years (1980–2012) and was actively engaged as president of The Mammal Society for sixteen years, a post that he held at the time of his death.

Following his PhD, in 1965 Derek gained a lectureship at the University of Manchester, an institution he served for forty years. Its students appreciated Derek's enthusiastic teaching and he also supervised twenty successful postgraduates. Fieldwork occupied a massive amount of Derek's own time as well as being part of his academic job, but a former head of department dismissed it as 'mere natural history', a hurtful failure to assess context and originality. Derek was dismayed, but took it in his stride. His versatility is evident from 235 formal scientific publications, ranging from fossils to studies of peat erosion, black grouse, sheep grazing, late-Glacial mammals, and use of abundance/mass relationships for assessing conservation priorities. He became especially interested in the history of British birds and mammals based on archaeological excavations and the analysis of place names, publishing various papers on the subject and two highly original books, *The History of British Mammals* (1999) and *The History of British Birds* (2009).

Derek rarely travelled abroad, but in 1968 he joined me as a zoological advisor on an Army expedition attempting to travel by boat down the Blue Nile in Ethiopia. This was a dangerous activity that had not previously been accomplished. The scientific objective was to collect specimens for the Natural History Museum in London. The expedition was highly successful and led to several more expeditions (without the Army), which significantly advanced knowledge of the mammals and amphibians of Ethiopia. Species new to science were found, including three (a frog, *Leptopelis yaldeni*, and two rodents, *Desmomys yaldeni* and *Otomys yaldeni*) named in recognition of Derek's contribution to studies of the Ethiopian fauna. Derek and colleagues published over twenty papers on Ethiopian animals, including a six-part catalogue and taxonomic review of the mammals, and Derek developed links with the University of Addis Ababa. He supervised a PhD study by one of its students, Afework Bekele, whose own PhD students were examined by Derek on another visit to the country a month before he died.

Occasionally Derek took short holidays to good wildlife places, and he once visited the Gambia where his Peak District sandpipers spent the winter. In the 1980s he made occasional contributions to BBC radio programmes, but everyday life centred around his academic work spanning an extraordinary breadth of endeavour. Recognizing this, in 2010 he was awarded the gold medal of The Linnean Society of London.

Derek became one of the most versatile and successful zoologists of his generation. He died in his sleep during a rare and brief holiday in the Forest of Dean, where he was looking forward to seeing his first British wild boar.

PAT MORRIS

Obituary

JACQUELINE SHANE, 1944–2013

Jacqueline Shane, who has passed away recently, was well known amongst the natural history and nature conservation community in west London, as both a very fine naturalist and as a passionate campaigner for wildlife.

Jacqueline joined the London Natural History Society in 1990, around the time we were both mature students on Birkbeck College's Ecology and Conservation Course. For several years, she served on LNHS Council. However, she was best known for her grass-roots work in her local south-west London area. The range of expertise which Jacqueline developed was remarkable, covering bats, birds and flora. She believed strongly in the value and importance of wildlife in the area and was not afraid to speak out at public meetings and official enquiries, always ready with the natural history facts to back up her opinions.

By the mid 1980s she was already a driving force in the Richmond and Twickenham Group of the London Wildlife Trust, for example organizing talks and walks and providing a LWT stall at local fairs. As well as her technical expertise, she proved to be very good at mobilizing people to do things that otherwise would not have been done. Ian McKinnon writes 'I will always be grateful to Jacqueline for her support when she was chair of Crane Park Island Management Committee. Thanks to her backing and encouragement we were able to create new habitats and increase biodiversity on the Nature Reserve as well as improving access for visitors.' Rose McManus recalls work parties to restore the old Mill Pond, where Jacqui waded deep into the muddy water to plant reeds. Jacqueline's legacy at Crane Park persists to the present day as for the third year running the Nature Reserve has been awarded Green Flag status.

During the planning stage for the Barnes WWT Centre in the early 1990s, Jacqueline joined me in some memorable bat surveys which identified the old reservoirs as one of the prime sites for bats in London, offering spectacular view of bats against the London skyline, thus helping to make sure bats were well up on the agenda in developing guidelines for the future centre's management. Bat walks have now become one of the highlights of the centre's summer programme. She challenged proposals for flood lighting on the adjacent sports fields for fear of the confusion it would cause local wildlife, especially bats. She was also involved in the fight to prevent building

development on the former goods yard area adjacent to Barnes Station on Barnes Common, which had developed an interesting flora. She spoke at the first enquiry about this, and the battle appeared to be won, although the decision was unfortunately overturned much later on appeal. At a more practical level, she also helped to improve the management of Kew Green pond.

A little later she became very active in the Richmond Park Wildlife Group, helping with skylark surveys at a time when it seemed doubtful they would survive for much longer as a breeding species in the park. The surveys identified where the last remaining pairs held territory, leading to management policy which discouraged off-lead dogs in that area. Thanks to such volunteer effort in support of the park's ecology team, the skylarks are now thriving. She led the development of an active flora group within the wider Wildlife Group, producing, with others in the group, a full list of the flora of the park, and also writing a guide to the plants in the park, which was published by the Friends of Richmond Park.

When proposals for the T5 terminal at Heathrow were put forward, Jacqueline became heavily involved in the environmental assessment, including the public inquiry which ran from 1995 to 1999. A number of local naturalists were greatly concerned at the proposal to build a spur road to the proposed new terminal across some fine wet meadows in the Colne Valley west of the airport. Jacqueline made the star discovery of water avens *Geum rivale* in these fields. This attractive plant, while common in the north and west of the country, is rare in the southeast and virtually unknown in the London area. Research established that the plant had last been recorded over a hundred years ago in the area by a naturalist called Lightfoot, and this find looked like a rediscovery at the site. The discovery of the plant, and much else of wildlife interest, did not dissuade the inspector from recommending the meadows be devastated by the road. However, agreement was reached that BAA (owner of the airport) would translocate the flora of the field to a site that they owned called Orchard Farm. A number of the original survey team, including Jacqueline, visited the site in 2010 and to their joy the water avens was still present.

Nic Ferriday adds 'I have other fond memories of Jacqueline. One was when we went for a walk on a bitterly cold day around Syon Park. While others in the group where complaining about the cold and eager to retreat to somewhere warm, Jacqueline was not bothered despite her chronic health problems.'

Jacqueline was born during the war years and brought up in the Primrose Hill area of north London. She was the daughter of activist parents, and in her younger years participated actively in the CND campaign. She originally trained as a mathematician and computer scientist, studying at Edinburgh University and later Sir John Cass College in London. After graduation, she followed her uncle Sidney Michaelson into the then rather new field of computer science and obtained a post at the London University Institute of Computer Science. When that closed in the early seventies, she transferred to Imperial College, where in 1975 she worked on a project known as the Science Museum Terminal, an early form of interactive computer display. This included a London Underground program to show how people in the future would be able to use computers to plan their travel.

However, by her early thirties her life became compromised by serious ill health, mainly nephritis, which soon resulted in end-stage renal failure.

She became a regular patient at St Mary's Hospital, Paddington, where despite the constraints of having dialysis twice a week, she was determined to lead as normal a life as possible. Amongst other things, in 1977 she surprised her doctors by successfully delivering a baby, her daughter Emma, which was a first for the St Mary's dialysis unit. In 1979, she received a kidney transplant, which at that time was still a fairly recent development. However, the high doses of immunosuppressants took their toll. In 1982, no longer able to manage a full-time job, she took early retirement from Imperial College.

However, this proved to be no 'arm chair and slippers' style of retirement. Having a love of gardening and the natural world, and building on her early experience with the London Wildlife Trust local group, she enrolled on Birkbeck College's ecology and nature conservation course, gaining the certificate in Ecology and Conservation in 1989. This undoubtedly spurred her on to achieve yet more for the local environment.

Jacqueline's friendly manner and dedication to the cause of biodiversity despite her ill health will be remembered by many beyond the west London area. She is already greatly missed. She is survived by her daughter Emma (who kindly provided much information for this tribute) and grandson David Emmanuel. My thanks also to Mary Clare Sheahan, Nic Ferriday and Ian McKinnon for their contributions.

JAN HEWLETT

Book reviews index

The London Naturalist

Instructions to contributors

Submission of papers

Papers **must be submitted in duplicate** to the editor, Mr K. H. Hyatt at his home address, 1 Tremcelynog, Rhandirmwyn, Llandovery, Carmarthenshire SA20 0NU. Please contact the editor before the end of January if you wish to contribute to the forthcoming issue. However, the editor may be contacted at any time on 01550 760346 to discuss possible contributions, and will be pleased to send a recent offprint to show our style, and as a guide to preparing the manuscript, **which should be followed as closely as possible in regard to layout and typefaces.** Manuscripts **must be double spaced throughout on one side of the paper only** and with wide (3-cm) margins. **Authors must retain a copy.** Papers should include at the beginning an **abstract, summary** or **synopsis. Sheets must be numbered.** Papers are peer-reviewed as appropriate. **After acceptance**, the editor would be pleased to receive contributions as Microsoft Word-compatible files (or they can be e-mailed to the printer) **together with two matching hard copies of the final text.** Papers should be relevant to the natural history and archaeology of the London Area. This includes comparisons between London and its surrounding countryside with other localities, as well as work relating to or comparing species or habitats which occur in the London Area. Contributions of relevance nationally will also be considered.

Text

Locality spellings should follow the latest editions of maps published by the Ordnance Survey. Capitalization should be kept to a minimum. Common names of animals and plants must begin with lower-case initials (except for proper nouns), and **only Latin names of genera and species should be typed in italic.** When both common and Latin names are given there should be no brackets or commas separating them. **Genus names should appear in full where first used within each paragraph.** When scientific names are taken from a standard work, which must be cited, authorities may be omitted. In descriptive matter numbers up to a hundred should be in words, except in a strictly numerical context. Dates should follow the logical sequence of day, month, year, i.e., 25 December 1971, but in lists may be as 25.xii.1971. Measurements should be in metric and follow the SI system (Système International d'Unités), with imperial equivalents in parentheses where appropriate. There should be no full point following Dr, Mr, Mrs, or St. Lists should be in systematic, alphabetic or numerical order. **Hyphens should not appear at the ends of lines** as the right-hand margins of manuscripts do not need to be justified: **turn off the hyphenation option. Tables and figure legends should be typed on separate sheets at the end of the text. Word-processed text should not use italic, bold or compressed typeface. Paragraphs should be indented. Sentences must not begin with numerals. Footnotes and endnotes should be avoided.**

References

Reference citation should follow the examples given below. Capitalization in titles of books and papers in journals should be kept to a minimum. Journal titles should be in full, or follow the abbreviations in the *World list of scientific periodicals,* and be underlined or in italics. Book titles should also be underlined or in italics. Examples are as follows:

In text:

Meadows (1970: 80) or (Meadows 1970).

In references:

MEADOWS, B. S. 1970. Observations on the return of fishes to a polluted tributary of the River Thames 1964–9. *Lond. Nat.* **49:** 76–81.

MELLANBY, K. 1970. *Pesticides and pollution.* Ed.2. Collins, London.

WHITE, K. G. 1959. Dimsdale Hall moat, part II. *Trans. a. Rep. N. Staffs. Fld Club* **92:** 39–45.

Authors must ensure that all references are cited accurately: they will not be checked by the editor.

Illustrations

Distribution maps should be submitted in the form of a recording map with symbols in Indian ink and stencilled or by transfers. Solid dots are used to indicate contemporary or recent presence, circles for old records, and crosses (not pluses) for other information, such as introduced species. The caption should be written outside the frame of the map and will be set up by the printer. Scale bars must be included **within** the frame of the map.

Line drawings should be in Indian ink on white card or tracing paper, larger than the printed size, but no larger than A4. Place names, etc., must be produced with stencils or with sharp typing. Captions should be separate as they will be set up by the printer, but keys that include special characters should be included **within** the border of the figure.

Computer-generated illustrations must be sharply defined and preferably be supplied digitally.

Photographs should be glossy black-and-white prints, of good contrast, preferably plate or half-plate in size, or, in colour as transparencies, either 35 mm or larger, or as high definition digital.

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